SONY

COLOR VIDEO PRINTER

UP-21MD

SERVICE MANUAL

Volume 1 1st Edition

⚠警告

このマニュアルは，サービス専用です。
お客様が，このマニュアルに記載された設置や保守，点検，修理などを行うと感電や火災，人身事故につながることがあります。
危険をさけるため，サービストレーニングを受けた技術者のみご使用ください。

⚠ WARNING

This manual is intended for qualified service personnel only.
To reduce the risk of electric shock, fire or injury, do not perform any servicing other than that contained in the operating instructions unless you are qualified to do so. Refer all servicing to qualified service personnel.

⚠ WARNUNG

Die Anleitung ist nur für qualifiziertes Fachpersonal bestimmt.
Alle Wartungsarbeiten dürfen nur von qualifiziertem Fachpersonal ausgeführt werden. Um die Gefahr eines elektrischen Schlages, Feuergefahr und Verletzungen zu vermeiden, sind bei Wartungsarbeiten strikt die Angaben in der Anleitung zu befolgen. Andere als die angegeben Wartungsarbeiten dürfen nur von Personen ausgeführt werden, die eine spezielle Befähigung dazu besitzen.

⚠ AVERTISSEMENT

Ce manual est destiné uniquement aux personnes compétentes en charge de l'entretien. Afin de réduire les risques de décharge électrique, d'incendie ou de blessure n'effectuer que les réparations indiquées dans le mode d'emploi à moins d'être qualifié pour en effectuer d'autres. Pour toute réparation faire appel à une personne compétente uniquement.

Mechanical Trouble NG Code List

NG_CODE1

Display message	NG command	NG data	Contents of NG	Symptom	Cheking point	Example of possible cause
MECHA TROUBLE HEAD	E1	08	HEAD_HOME_TIME_OUT	Cannot move head to head up position, time runs out	• Relation of DC motor "MEC-15/CN202, CN205, IC203" "SY-299/CN302, IC302" • Relation of sensor "MEC-15/CN101, CN104" "SY-299/CN301, IC302" S8/S9	• DC motor harness is not connected. • Sensor harness is not connected. • Overload is applied to mechanical block. • Head cam FG has damaged. etc.
		09	HEAD_HOME_PICK_TIMEOUT	Cannot move head from head up to paper pick position, time runs out		
		0a	HEAD_PICK_HALF1_TIMEOUT	Cannot move head from paper pick to head half position, time runs out		
		0b	HEAD_HALF1_DOWN1_TIMEOUT	Cannot move head from head half to Y print position, time runs out		
		0c	HEAD_DOWN1_HALF2_TIMEOUT	Cannot move head from Y print to head half position, time runs out		
		10	HEAD_HALF2_DOWN2_TIMEOUT	Cannot move head from head half to M print position, time runs out		
		11	HEAD_DOWN2_HALF3_TIMEOUT	Cannot move head from M print to head half position, time runs out		
		12	HEAD_HALF3_DOWN3_TIMEOUT	Cannot move head from head half to C print position, time runs out		
		13	HEAD_DOWN3_HALF4_TIMEOUT	Cannot move head from C print to head half position, time runs out		
		14	HEAD_HALF4_DOWN4_TIMEOUT	Cannot move head from head half to L print position, time runs out		
		15	HEAD_DOWN4_HOME_TIMEOUT	Cannot move head from L print to head up position, time runs out		
		16	HEAD_DOWN3_HOME_TIMEOUT	Cannot move head from C print to head up position, time runs out		
		17	HEAD_PICK_HALF2_TIMEOUT	Cannot move head from paper pick to head half position, time runs out		
		1f	HEAD_POS_ERROR	Cannot detect head position		
		1d	HEAD_COLD_ERROR	Detects the abnormal temperature of thermal head thermistor	• Thermal head "SY-299/CN401, IC302"	• Thermal head has failed. • Thermal head harness is not connected or damaged etc,.
		1e	HEAD_HEAT_TIMEOUT	Cannot rise the regular temperature during pre-heating of a thermal head, time runs out		
CHECK RIBBON	E1	34	RIBBON_MCL_TIMEOUT	Detects index mark during magenta or cyan indexing of an ink ribbon by sensor S3, time runs out	• Relation of DC motor "MEC-15/CN202, CN205, IC203" "SY-299/CN302, IC302" • Relation of sensor "MEC-15/CN101, CN103, IC101, IC104" "SY-299/CN301, IC302" S3	• Sensor harness is not connected. • Ribbon take-up torque incorrectly. etc.
		A0	CHECK RIBBON	Detects an unused ribbon by a ribbon type detect sensor 0 to 2 (S5 to S7)	"MEC-15/CN101, CN103, IC101, IC105" "SY-299/CN301, IC302" S5-S7	• Type reflection port of an ink ribbon has failed. • Sensor harness is not connected. • Optical axis is out of place because of sensor board is installed incorrectly.
MECHA TROUBLE LOAD /CHECK PAPER LOAD	E1	51	LOAD_TMG_TIMEOUT	Printing paper is not fed until a feed sensor (S2) when feeding paper, time runs out	• Relation of DC motor "MEC-15/CN202, CN205, IC203" "SY-299/CN302, IC302" • Relation of sensor "MEC-15/CN101, CN103, IC101, IC103" "SY-299/CN301, IC302" S2	• Sensor harness is not connected. • Paper feed is fault by reduce of friction on paper feed roller. • Paper feed tray has damaged. etc.

(Continued)

(Continued of NG_CODE1)

Display message	NG command	NG data	Contents of NG	Symptom	Cheking point	Example of possible cause
MECHA TROUBLE LOAD /CHECK PAPER LOAD	E1	52	PULLIN_TMG_TIMEOUT	Printing paper cannot be pulled in from a paper feed sensor (S2) to the inside of a unit when feeding paper, time runs out	• Relation of stepping motor "MEC-15/CN202, CN206, IC204" "SY-299/CN302, IC302" • Relation of sensor "MEC-15/CN101, CN103, IC101, IC103" "SY-299/CN301, IC302" S2	• Stepping motor harness is not connected. • Sensor harness is not connected. • Loss of synchronism in a stepping motor. • Overload is applied to grip roller mechanism. • Overlapped paper feed. etc.
		56	LOAD_PAPER_SHORT	Detects short paper during load by a paper feed sensor (S2) when feeding paper, time runs out		
MECHA TROUBLE EJECT /CHECK PAPER EJECT	E1	58	PUSHOUT_TMG_TIMEOUT	Print paper cannot be pushed out from the inside of a unit to a paper feed sensor (S2) when paper ejection, time runs out		
		59	EJECT_TMG_TIMEOUT	Printing paper cannot be ejected from paper feed sensor (S2) to the outside of a unit when paper ejection, time runs out		
MECHA TROUBLE PROCESS	E1	61	PP_LD_MISSING_ERR	Detects paper is not existed under paper exist timing conditions by a paper feed sensor (S2) when retracting paper	• Relation of stepping motor "MEC-15/CN202, CN206, IC204" "SY-299/CN302, IC302" • Relation of sensor "MEC-15/CN101, CN103, IC101, IC103" "SY-299/CN301, IC302" S2	• Sensor harness is not connected. • Overload is applied to grip roller mechanism. • Loss of synchronism in a stepping motor. etc.
		62	PP_LD_JAM_ERR	Detects paper exist under paper is not existed timing conditions by a paper feed sensor (S2) when retracting paper		
		63	PP_JAM_ERR	Detects paper exist under paper is not existed timing conditions by a jamming sensor (S10) when retracting paper	• Relation of stepping motor "MEC-15/CN202, CN206, IC204" "SY-299/CN302, IC302" • Relation of sensor "MEC-15/CN101, CN105" "SY-299/CN301, IC302" S10	• Sensor harness is not connected. • Overload is applied to stepping motor mechanism. • Loss of synchronism in a stepping motor. • Overlapped paper feed. etc.
		64	PP_JAM_MISSING_ERR	Detects paper is not existed under paper exist timing conditions by a jamming sensor (S10) when retracting paper		
		65	PP_PRINT_TIMEOUT	Long time is spent in printing, time runs out		
MECHA TROUBLE SENSOR	E1	73	RBN_CD_ALARM	Fall detection level of a ribbon cueing detect sensor (S3)	"MEC-15/CN101, CN103, IC101, IC103-IC105" "SY-299/CN301, IC302" Each sensor (S1-S7)	• Deterioration in sensitivity of sensor due to dust etc,.
		74	PAPER_LD_ALARM	Fall detection level of a paper in sensor (S1)		
		75	PAPER_IN_ALARM	Fall detection level of a paper feed sensor (S2)		
		76	RBN_TYPE0_ALARM	Fall detection level of a ribbon type detect sensor 0 (S5)		
		77	RBN_TYPE1_ALARM	Fall detection level of a ribbon type detect sensor 1 (S6)		
		78	RBN_TYPE2_ALARM	Fall detection level of a ribbon type detect sensor 2 (S7)		
		7 f	ROOM_HEAT_ERROR	Detects abnormal high temperature in a room thermistor	"MEC-15/THP201, CN202" "SY-299/CN302, IC302"	• Defective of harness etc,.

A way at looking the list: For NG_CODE2 to 5, refer to HEX code converting as binary. (Example For h'42 = 0100 0010: sixth bit and first bit)

NG_CODE2

NG command	NG data	Contents of NG	Symptom	Cheking point	Example of possible cause
E2	BIT 2	PAPER_JAM_SENS	Defective of a jamming sensor (S10) detection (when mechanism adjustment)	"MEC-15/CN101, CN105" "SY-299/CN301, IC302" S10	• Sensor harness is not connected. • Sensor board is installed incorrectly.
	BIT 1	PAPER_EJ_SENS	Defective of a delivery flap sensor (S11) detection (when mechanism adjustment)	"MEC-15/CN101, CN106" "SY-299/CN301, IC302" S11	
	BIT 0	DOOR_SENS	Defective of a front panel opening sensor detection (when mechanism adjustment)	SE-642 "KEY-49/CN301, CN302" "SY-299/CN203, IC302"	

NG_CODE3

NG command	NG data	Contents of NG	Symptom	Cheking point	Example of possible cause
E3	BIT 6 BIT 5	HEAD THERMISTOR	Defective of a temperature detection of a head thermistor (when mechanism adjustment)	Thermal head "SY-299/CN401, IC302"	• Thermal head harness is not connected. etc.
	BIT 4 BIT 3	ROOM THERMISTOR	Defective of temperature detection of a room thermistor (THP201 on the MEC-15 board) (when mechanism adjustment)	"MEC-15/THP201, CN202" "SY-299/CN302, IC302"	• Harness is not connected.
	BIT 0	EEPROM	Cannot write or read correctly in EEPROM (IC102 on the MEC-15 board) (when mechanism adjustment)	"MEC-15/IC102, CN101" "SY-299/CN301, IC302"	• Harness is not connected.

NG_CODE4

NG command	NG data	Contents of NG	Symptom	Cheking point	Example of possible cause
E4	BIT 5 BIT 4	RBN_CD_SENS	Defective of a ribbon cueing sensor (S3) detection (when mechanism adjustment)	"MEC-15/CN101, CN103, IC101, IC104" "SY-299/CN301, IC302" S3	• Sensor harness is not connected. • Optical axis is out of place because of sensor board is installed incorrectly.
	BIT 3 BIT 2	PAPER_LD_SENS	Defective of a paper feed sensor (S2) detection (when mechanism adjustment)	"MEC-15/CN101, CN103, IC101, IC103" "SY-299/CN301, IC302" S2	
	BIT 1 BIT 0	PAPER_IN_SENS	Defective of a paper in sensor (S1) detection (when mechanism adjustment)	"MEC-15/CN101, CN103, IC101, IC103" "SY-299/CN301, IC302" S1	

NG_CODE5

NG command	NG data	Contents of NG	Symptom	Cheking point	Example of possible cause
E5	BIT 5 BIT 4	RBN_TYPE_SENS2	Defective of a ribbon type sensor 2 (S7) detection (when mechanism adjustment)	"MEC-15/CN101, CN103, IC101, IC105" "SY-299/CN301, IC302" S7	• Sensor harness is not connected. • Optical axis is out of place because of sensor board is installed incorrectly.
	BIT 3 BIT 2	RBN_TYPE_SENS1	Defective of a ribbon type sensor 1 (S6) detection (when mechanism adjustment)	"MEC-15/CN101, CN103, IC101, IC105" "SY-299/CN301, IC302" S6	
	BIT 1 BIT 0	RBN_TYPE_SENS0	Defective of a ribbon type sensor 0 (S5) detection (when mechanism adjustment)	"MEC-15/CN101, CN103, IC101, IC104" "SY-299/CN301, IC302" S5	

Table of Contents

Manual Structure

Purpose of this manual 3
Related manuals 3

1. Service Information

1-1. Board Location 1-1
1-2. Main Parts Location 1-1
1-3. Removal and Installation of Cabinet 1-2
1-3-1. Top Cover 1-2
1-3-2. Ribbon Panel Assembly 1-2
1-3-3. Front Panel Assembly 1-3
1-4. Replacement of Main Parts 1-4
1-4-1. Mechanical Deck Assembly 1-4
1-4-2. Head Assembly 1-6
1-4-3. DC Fan 1-6
1-4-4. DC Motor Assembly 1-7
1-4-5. Stepping Motor Assembly 1-8
1-4-6. Grip Belt 1-8
1-4-7. S11 Sensor Board 1-9
1-4-8. S2/RIBBON Sensor Board 1-9
1-4-9. S1 Sensor Board 1-10
1-4-10. S8/S9 Sensor Board 1-10
1-4-11. Eject Roller Assembly 1-11
1-4-12. Photo Sensor 1-11
1-4-13. Interlock Switch Assembly 1-12

2. Electrical Alignment and Mechanical Alignment

2-1. Electrical Adjustment 2-1
2-1-1. Density Adjustment during Thermal Head Replacement 2-1
2-1-2. Output of Test Pattern (Internal Signal) in Service Mode 2-3
2-1-3. Electrical Adjustment (Analog Video Block) 2-4
2-2. Mechanical Adjustment 2-8
2-2-1. Mechanical Adjustment Mode 2-8
2-2-2. Entering the Mechanical Adjustment Mode 2-8
2-2-3. Normal Operation Check and Automatic Adjustment 2-9

3. Sensor Arrangement and Functional Description

4. Circuit Operation Description

4-1. Digital Video Signal Processing Block 4-1
4-1-1. Outline 4-1
4-1-2. Flow of Image Signal in Each Operating Mode 4-2
4-1-3. Basic Operation Timing and CPU Block 4-6
4-1-4. Memory (DRAM) Block 4-10
4-1-5. Memory Control Block 4-11
4-1-6. Color Adjustment Block 4-13
4-1-7. Sampling Clock Generation Block 4-14
4-1-8. Masking Block 4-14
4-1-9. A/D and D/A Conversion Blocks 4-14
4-2. Analog Video Signal Processing Block 4-15
4-2-1. Outline 4-15
4-2-2. Interface Block (IF-851 Board) 4-15
4-2-3. Analog Video Signal Processing Block (Part of VPR-74 Board) 4-16
4-3. Operation Description of Print Control Block Circuit 4-23
4-3-1. CPU Flowchart 4-23
4-3-2. CPU (IC302) Memory Map 4-23
4-3-3. Outline of Motor Drive Function Blocks 4-24
4-3-4. Outline of Sensor Detection Circuits 4-26
4-3-5. Head Control Block 4-31
4-4. Circuit Operation Description of System Control Block 4-33
4-4-1. Special Mode and Special Operating Method 4-33
4-4-2. Address Map 4-33
4-4-3. Circuit Operation 4-34
4-4-4. Communication with Internal CPU in Unit 4-35
4-4-5. Analog Video Block (VA) Control on the VPR-74 Board 4-36
4-4-6. RS Communication Control 4-38
4-4-7. Media Protection such for Software 4-38

5. Troubleshooting

5-1. Video (Image) Related Trouble 5-1
5-2. Mechanical Troubleshooting 5-3

Mechanical Trouble NG Code List

Manual Structure

Purpose of this manual

This manual is the Service Manual Vol.1 of the Color Video Printer UP-21MD. This manual contains the service information, electrical alignment and mechanical alignment, sensor arrangement and functional description, circuit operation description and troubleshooting.

Related manuals

In addition to this Service Manual Vol.1, the following manual is provided.

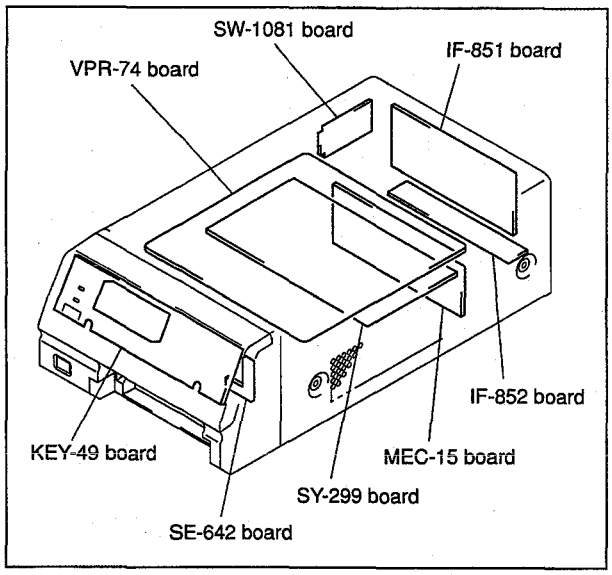
- **Service Manual Vol.2**
  Part No.: 9-955-307-21 (for J, UC, CE)
  Contains the semiconductor pin assignment, spare parts, block diagrams, schematic diagrams and board layouts.

- **Instruction Manual**
  Part No.: 3-206-154-11
  This manual describes the information required for the actual management and operation of this unit.

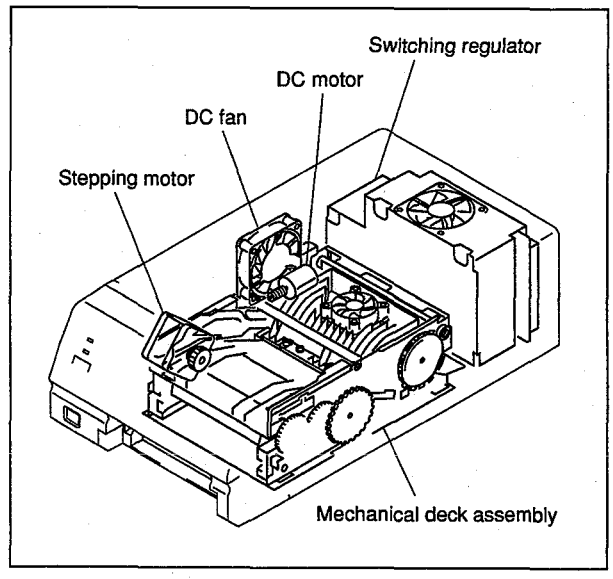
- **"Semiconductor Pin Assignments" CD-ROM (Available on request)**
  This "Semiconductor Pin Assignments" CD-ROM allows you to search for semiconductors used in B&P Company equipment.
  Semiconductors that cannot be searched for on this CD-ROM are listed in the service manual for the corresponding unit. The service manual contains a complete list of all semiconductors and their ID Nos., and thus should be used together with the CD-ROM.
  Part number: 9-968-546-XX

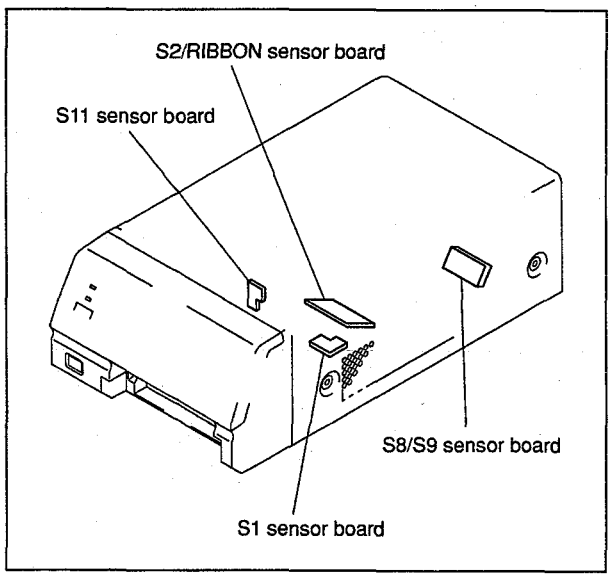
Section 1
Service Information

1-1. Board Location



1-2. Main Parts Location

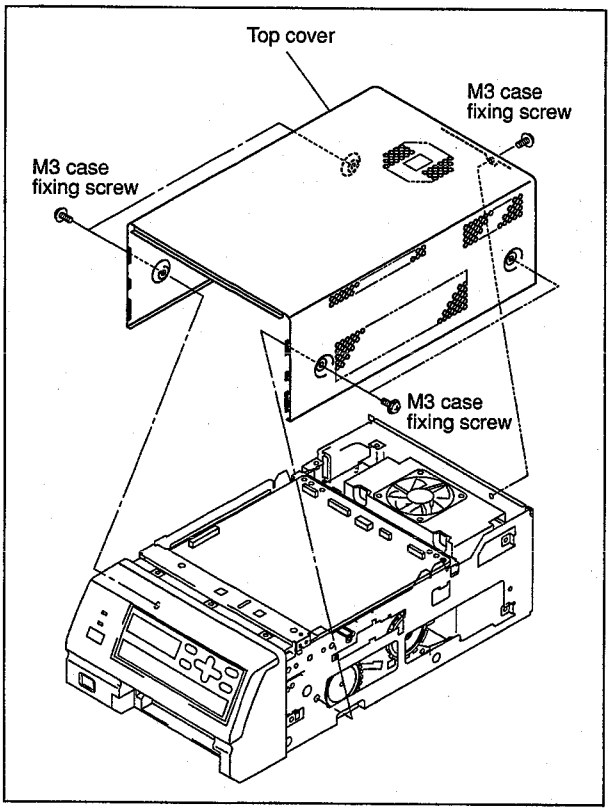




1-3. Removal and Installation of Cabinet

1-3-1. Top Cover

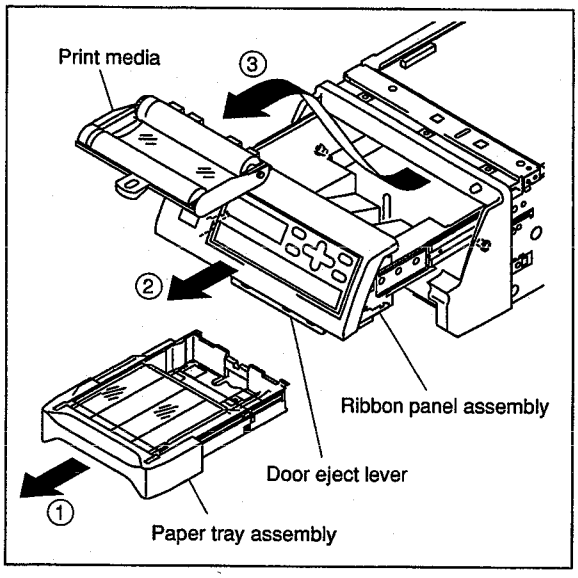
1. Remove the five M3 case fixing screws and then remove the top cover.



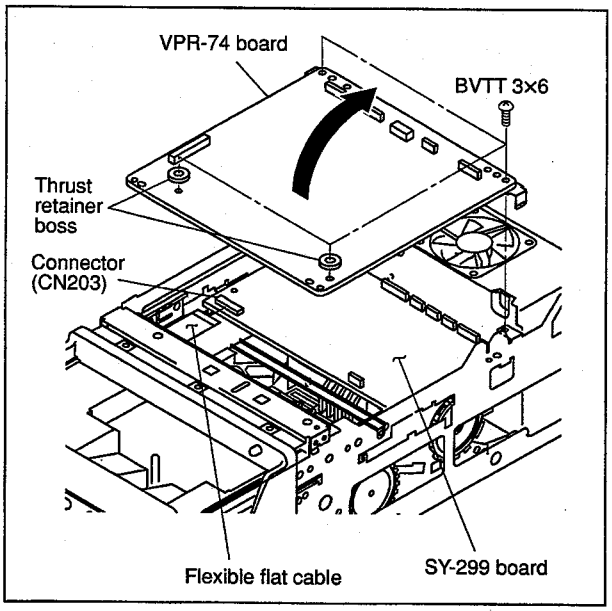
2. Re-attach the top cover in the reverse order of step 1.

1-3-2. Ribbon Panel Assembly

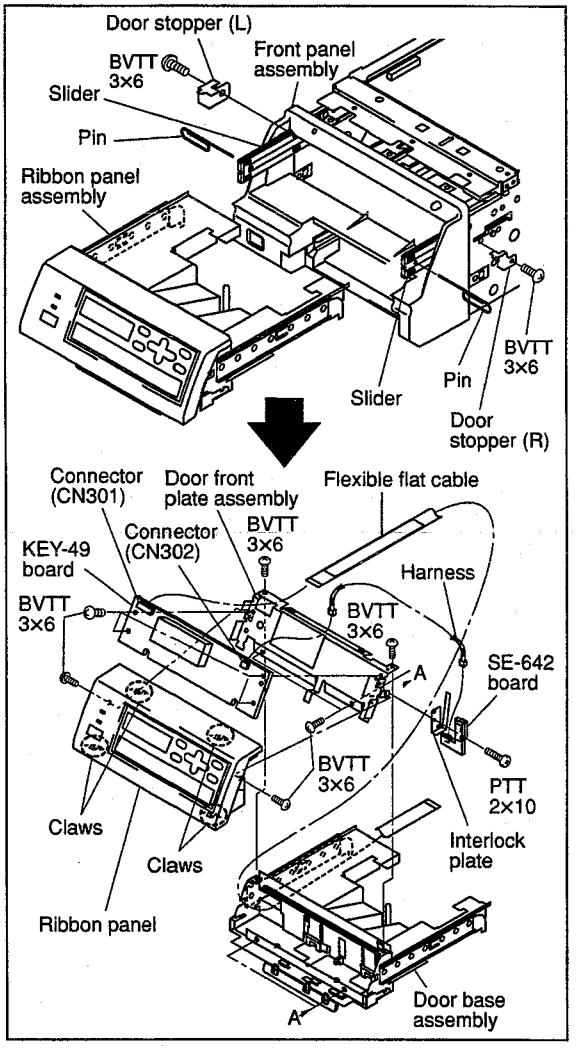
1. Remove the top cover. (Refer to Section 1-3-1.)
2. Pull out the paper tray assembly in the direction indicated by arrow ①.
3. Release the door eject lever and pull out the ribbon panel assembly in the direction indicated by arrow ②.
4. Pull out the print media in the direction indicated by arrow ③.



5. Remove the four screws and thrust retainer boss, and then open the VPR-74 board in the direction indicated by the arrow.
6. Disconnect the flexible flat cable from the connector (CN203) on the SY-299 board.



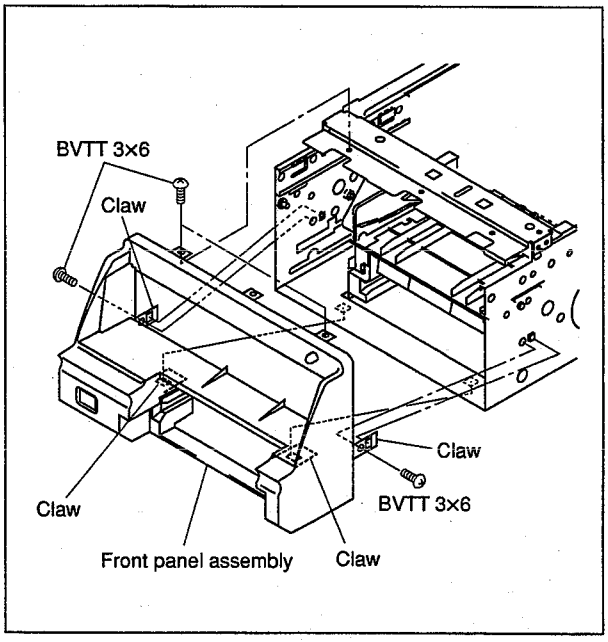
7. Remove the front panel. (Refer to Section 1-3-3.)
8. Remove the two screws (BVTT 3 × 6) and then remove the door stoppers ((L) and (R)).
9. Insert pins into the two holes of sliders and remove the ribbon panel assembly.
10. Remove the two screws (BVTT 3 × 6) and four claws, then remove the ribbon panel.
11. Disconnect one flexible flat cable and one harness from the connectors (CN301 and CN302) on the KEY-49 board.
12. Remove the four screws (BVTT 3 × 6), then remove the KEY-49 board.
13. Remove the four screws (BVTT 3 × 6), then remove the front plate assembly.
14. Remove one screw (PTT 2 × 10), then remove the interlock plate and SE-642 board.



15. Re-attach the ribbon panel assembly in the reverse order of steps 1 to 14.

1-3-3. Front Panel Assembly

1. Remove the top cover. (Refer to Section 1-3-1.)
2. Remove the paper tray assembly. (Refer to Section 1-3-2.)
3. Remove the ribbon panel assembly. (Refer to Section 1-3-2.)
4. Remove the four screws and four claws and then remove the front panel assembly.

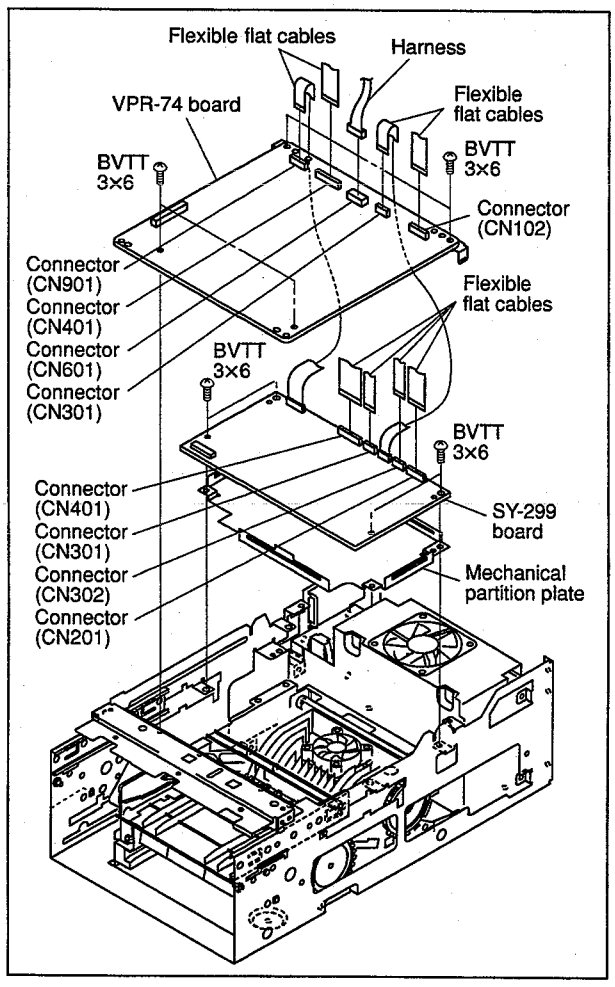


5. Re-attach the front panel assembly in the reverse order of steps 1 to 4.

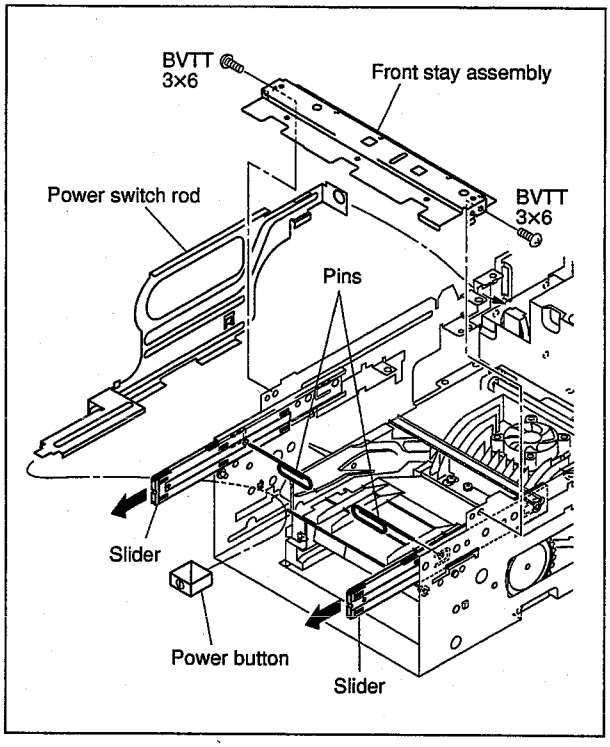
1-4. Replacement of Main Parts

1-4-1. Mechanical Deck Assembly

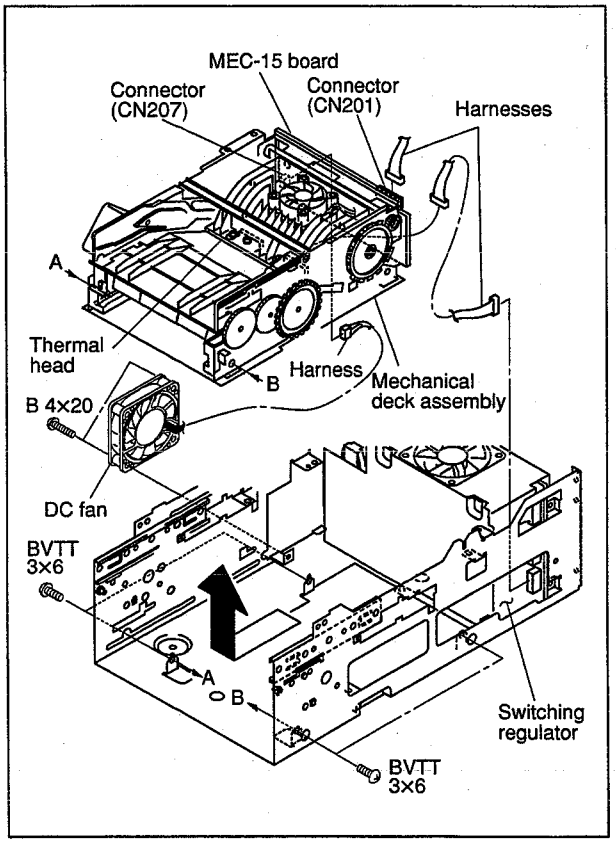
1. Remove the top cover. (Refer to Section 1-3-1.)
2. Disconnect the four flexible flat cables and one harness from the connectors (CN102, CN301, CN401, CN601, and CN901) on the VPR-74 board.
3. Remove the ribbon panel assembly. (Refer to Section 1-3-2.)
4. Remove the front panel assembly. (Refer to Section 1-3-3.)
5. Disconnect the four flexible flat cables from the connectors (CN201, CN301, CN302, and CN401) on the SY-299 board.
6. Remove the four screws, then remove the SY-299 board and mechanical partition plate.



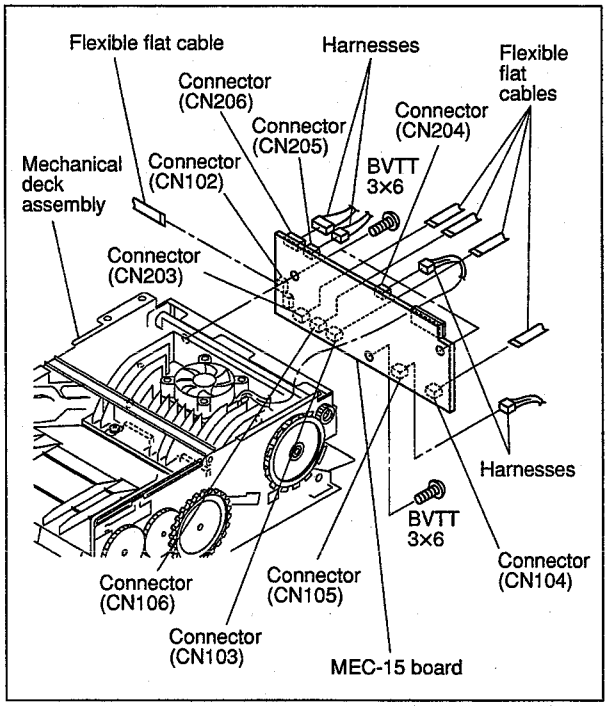
7. Remove the two screws and then remove the front stay assembly.
8. Remove the power button, then remove the power switch rod.



9. Remove the two screws (B 4 × 20) and then remove the DC fan.
10. Disconnect the two harnesses from the connectors (CN201 and CN207) on the MEC-15 board.
11. Disconnect one harness connected to the thermal head from the switching regulator.
12. Remove the four screws (BVTT 3 × 6) and then remove the mechanical deck assembly in the direction indicated by the arrow.



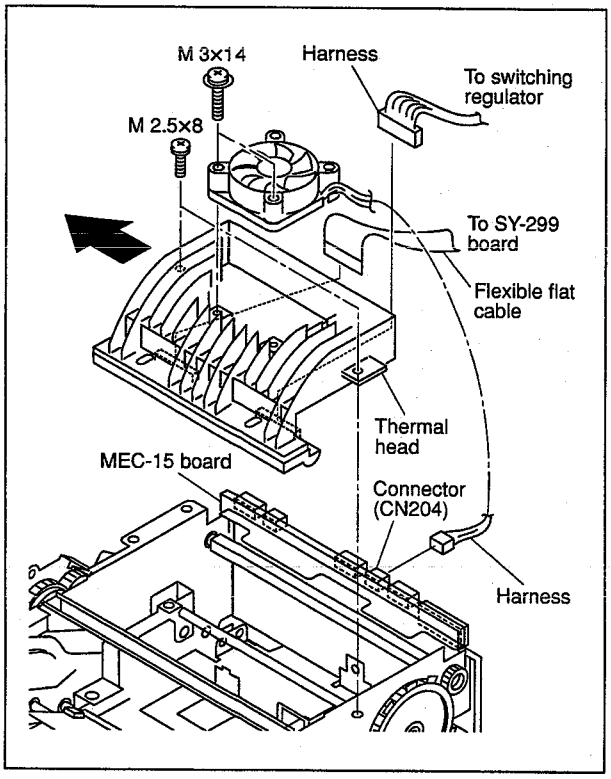
13. Disconnect the five harnesses from the connectors (CN105, CN203, CN204, CN205, and CN206) and the four flexible flat cables from the connectors (CN102, CN103, CN104, and CN106).
14. Remove the three screws and then remove the MEC-15 board.



15. Attach mechanical deck assembly in the reverse order of steps 1 to 14.

1-4-2. Head Assembly

1. Remove the top cover. (Refer to Section 1-3-1.)
2. Remove the ribbon panel assembly. (Refer to Section 1-3-2.)
3. Remove the front panel assembly. (Refer to Section 1-3-3.)
4. Remove the mechanical deck assembly. (Refer to Section 1-4-1.)
5. Disconnect one harness from the connector (CN204) on the MEC-15 board.
6. Remove the two screws (M 3 × 14), and then remove the DC fan.
7. Remove the two screws (M 2.5 × 8), then remove the head assembly.



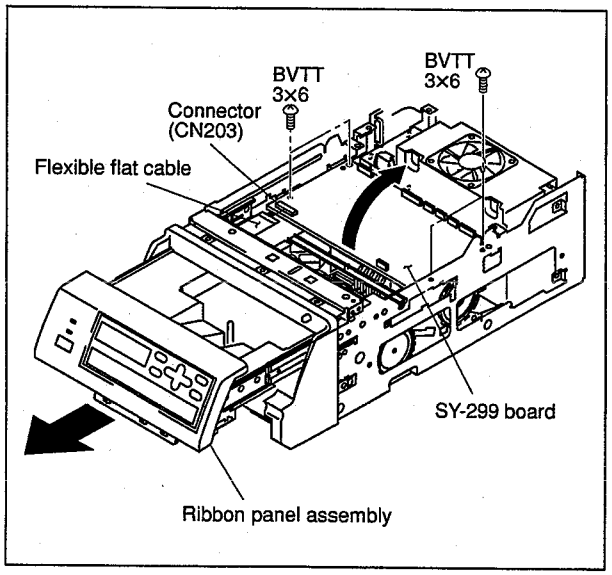
8. Attach head assembly in the reverse order of steps 1 to 7.

Note

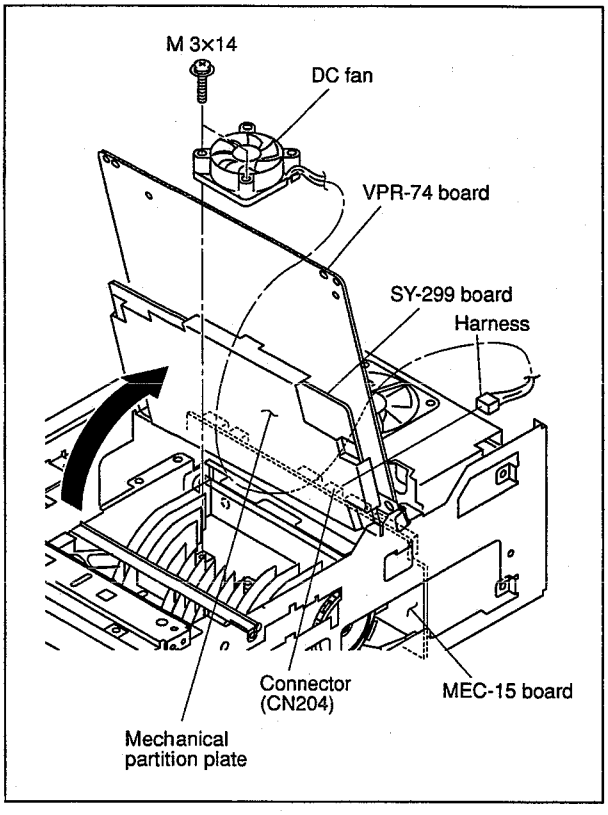
When attaching the head assembly, set the assembly in the direction indicated by the arrow, then tighten the two screws.

1-4-3. DC Fan

1. Remove the top cover. (Refer to Section 1-3-1.)
2. Open the VPR-74 board. (Refer to Section 1-3-2.)
3. Pull out the ribbon panel assembly and disconnect one flexible flat cable from the connector (CN203) on the SY-299 board.
4. Remove the four screws.



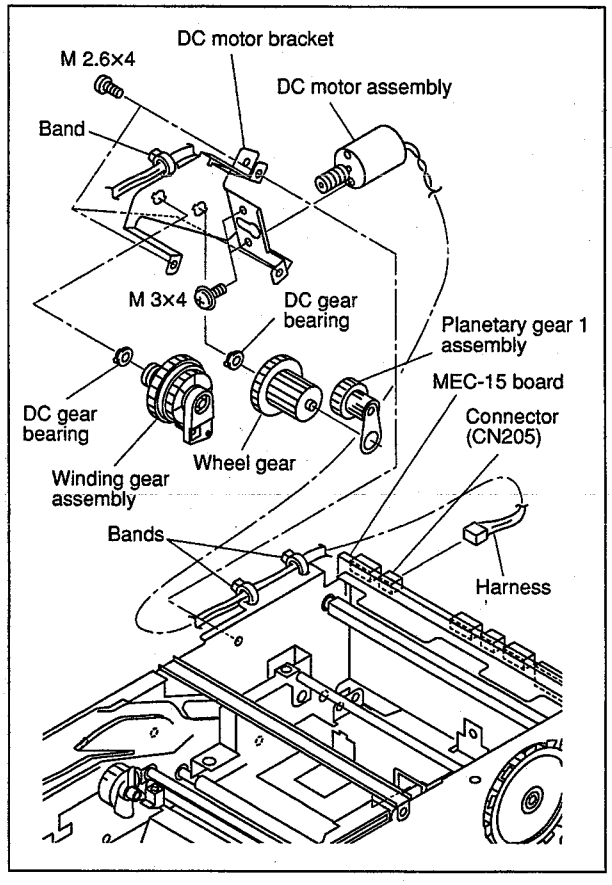
5. Open the SY-299 board and mechanical partition plate in the direction indicated by the arrow.
6. Remove the two screws, then remove the DC fan.
7. Disconnect the harness from the connector (CN204) on the MEC-15 board.



8. Attach DC fan in the reverse order of steps 1 to 7.

1-4-4. DC Motor Assembly

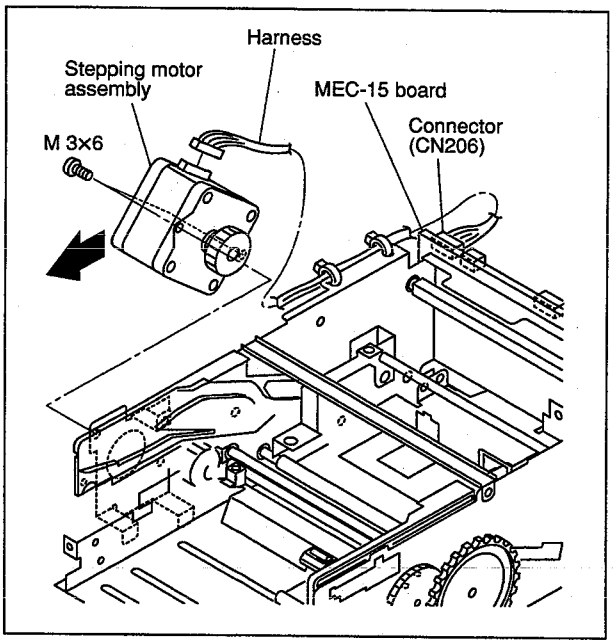
1. Remove the top cover. (Refer to Section 1-3-1.)
2. Remove the ribbon panel assembly. (Refer to Section 1-3-2.)
3. Remove the front panel assembly. (Refer to Section 1-3-3.)
4. Remove the mechanical deck assembly. (Refer to Section 1-4-1.)
5. Remove the three screws (M 2.6 × 4) and then remove the DC motor bracket.
6. Remove the winding gear assembly, wheel gear, planetary gear 1 assembly, and two DC gear bearings.
7. Cut the three bands.
8. Remove the two screws (M 3 × 4) and then remove the DC motor assembly.
9. Remove one harness from the connector.



10. Attach a new DC motor assembly in the reverse order of steps 1 to 9.

1-4-5. Stepping Motor Assembly

1. Remove the top cover. (Refer to Section 1-3-1.)
2. Remove the ribbon panel assembly. (Refer to Section 1-3-2.)
3. Remove the front panel assembly. (Refer to Section 1-3-3.)
4. Remove the mechanical deck assembly. (Refer to Section 1-4-1.)
5. Disconnect one harness from the connector (CN206) on the MA-15 board.
6. Disconnect the harness from the stepping motor assembly.
7. Remove the two screws and then remove the stepping motor assembly.



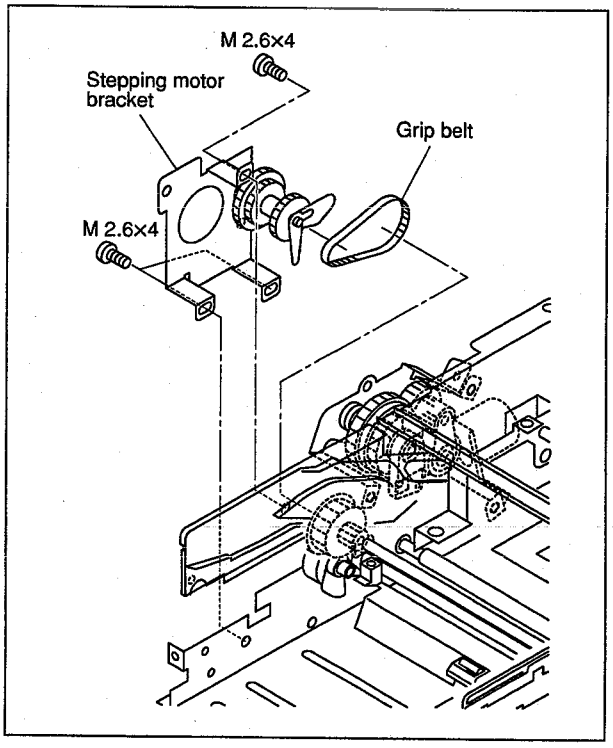
8. Attach stepping motor assembly in the reverse order of steps 1 to 7.

Note

When attaching the stepping motor assembly, set the assembly in the direction indicated by the arrow, then tighten the two screws.

1-4-6. Grip Belt

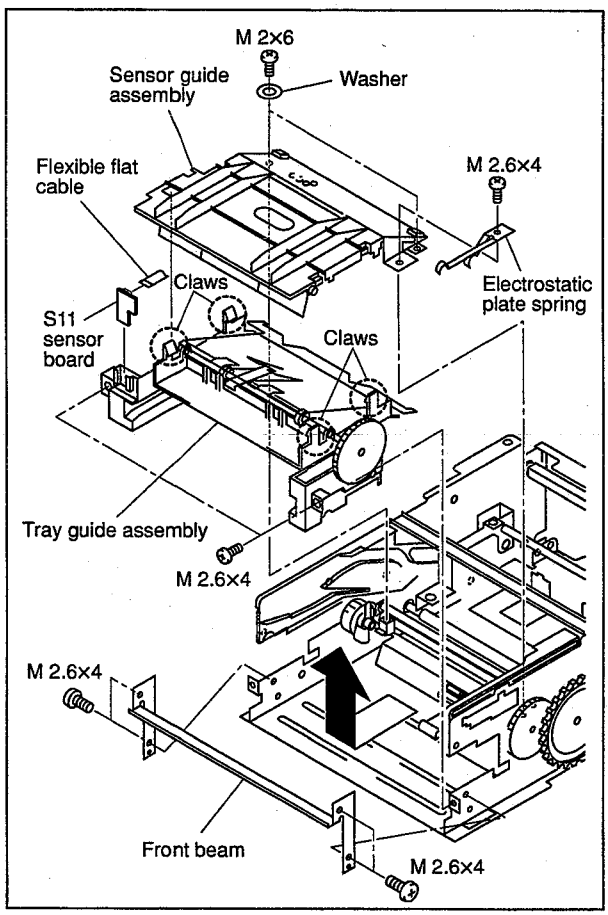
1. Remove the top cover. (Refer to Section 1-3-1.)
2. Remove the ribbon panel assembly. (Refer to Section 1-3-2.)
3. Remove the front panel assembly. (Refer to Section 1-3-3.)
4. Remove the mechanical deck assembly. (Refer to Section 1-4-1.)
5. Remove the sensor guide assembly and tray guide assembly. (Refer to Section 1-4-7.)
6. Remove the stepping motor assembly. (Refer to Section 1-4-5.)
7. Remove the three screws and then remove the stepping motor bracket.
8. Remove the grip belt.



9. Attach a new grip belt in the reverse order of steps 1 to 8.

1-4-7. S11 Sensor Board

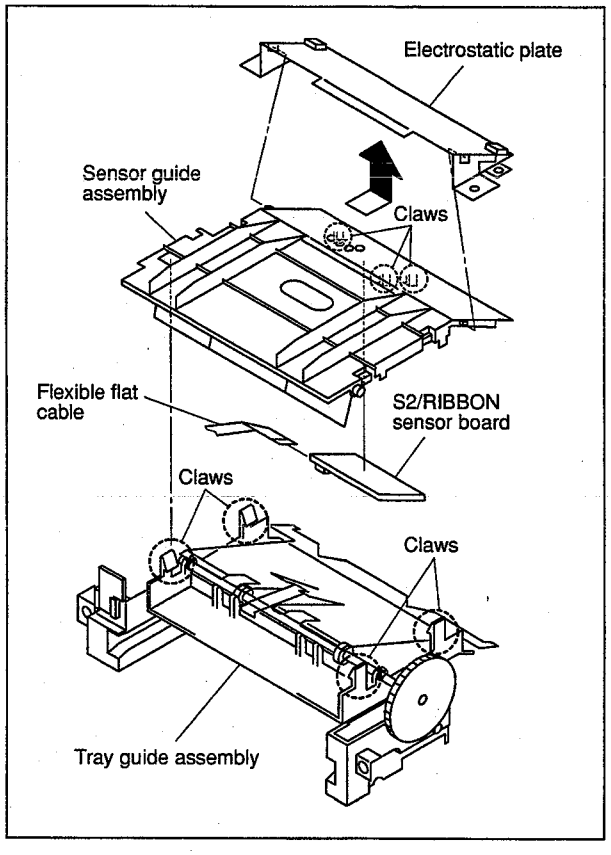
1. Remove the top cover. (Refer to Section 1-3-1.)
2. Remove the ribbon panel assembly. (Refer to Section 1-3-2.)
3. Remove the front panel assembly. (Refer to Section 1-3-3.)
4. Remove the mechanical deck assembly. (Refer to Section 1-4-1.)
5. Remove the four screws (M 2.6 × 4) and then remove the front beam.
6. Remove one screw (M 2.6 × 6) and then remove the electrostatic plate spring.
7. Remove the two screws (M 2 × 6), washer and four claws, then remove the sensor guide assembly.
8. Remove the two screws (M 2.6 × 4) and then remove the tray guide assembly.
9. Disconnect one flexible flat cable and remove the S11 sensor board.



10. Attach a new S11 sensor in the reverse order of steps 1 to 9.

1-4-8. S2/RIBBON Sensor Board

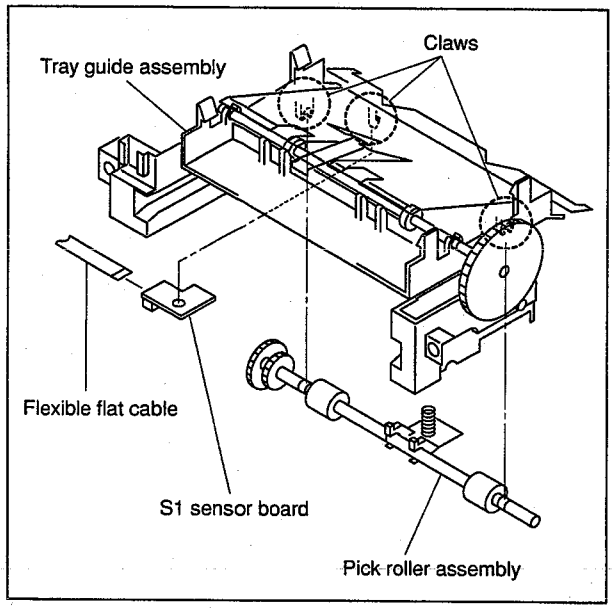
1. Remove the top cover. (Refer to Section 1-3-1.)
2. Remove the ribbon panel assembly. (Refer to Section 1-3-2.)
3. Remove the front panel assembly. (Refer to Section 1-3-3.)
4. Remove the mechanical deck assembly. (Refer to Section 1-4-1.)
5. Remove the tray guide assembly. (Refer to Section 1-4-7.)
6. Remove the four claws and then remove the sensor guide assembly.
7. Remove the electrostatic plate in the direction indicated by the arrow.
8. Remove the three claws, disconnect one flexible flat cable, and remove the S2/RIBBON sensor board.



9. Attach S2/RIBBON sensor board in the reverse order of steps 1 to 8.

1-4-9. S1 Sensor Board

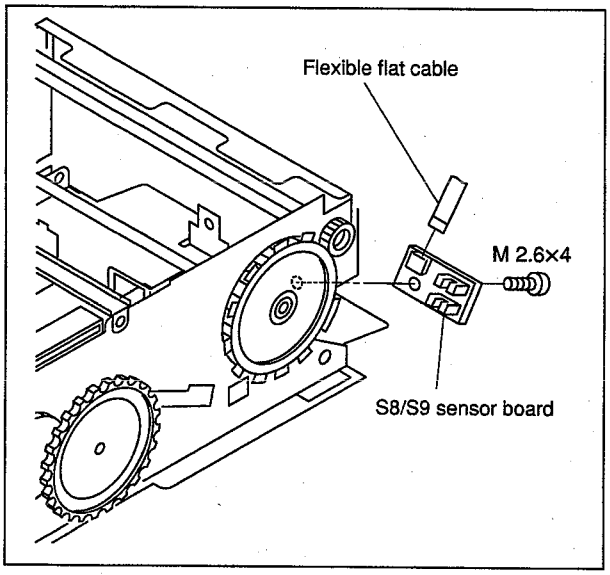
1. Remove the top cover. (Refer to Section 1-3-1.)
2. Remove the ribbon panel assembly. (Refer to Section 1-3-2.)
3. Remove the front panel assembly. (Refer to Section 1-3-3.)
4. Remove the mechanical deck assembly. (Refer to Section 1-4-1.)
5. Remove the tray guide assembly. (Refer to Section 1-4-7.)
6. Remove the two claws and then remove the pick roller assembly.
7. Remove one claw, disconnect one flexible flat cable, and remove the S1 sensor board.



8. Attach a new S1 sensor board in the reverse order of steps 1 to 7.

1-4-10. S8/S9 Sensor Board

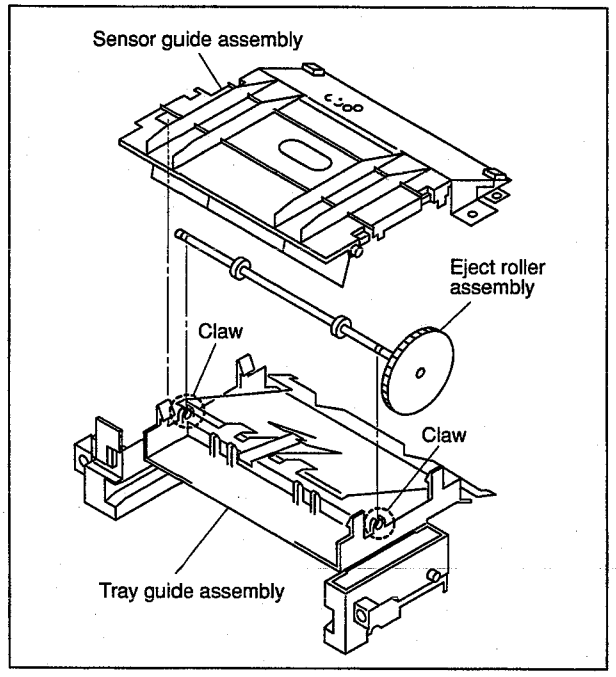
1. Remove the top cover. (Refer to Section 1-3-1.)
2. Remove the ribbon panel assembly. (Refer to Section 1-3-2.)
3. Remove the front panel assembly. (Refer to Section 1-3-3.)
4. Remove the mechanical deck assembly. (Refer to Section 1-4-1.)
5. Remove one screw, disconnect one flexible flat cable, and remove the S8/S9 sensor board.



6. Attach a new S8/S9 sensor board in the reverse order of steps 1 to 5.

1-4-11. Eject Roller Assembly

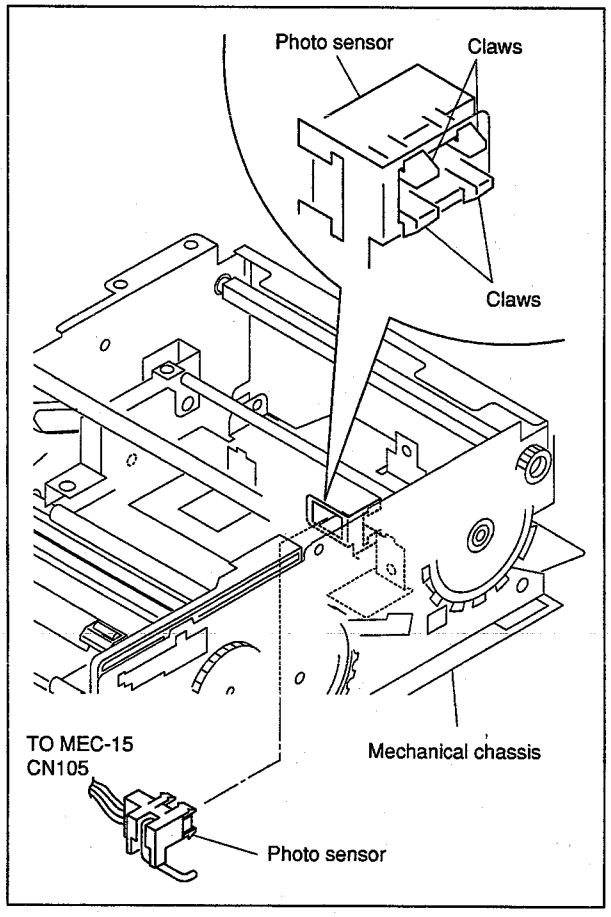
1. Remove the top cover. (Refer to Section 1-3-1.)
2. Remove the ribbon panel assembly. (Refer to Section 1-3-2.)
3. Remove the front panel assembly. (Refer to Section 1-3-3.)
4. Remove the mechanical deck assembly. (Refer to Section 1-4-1.)
5. Remove the tray guide assembly. (Refer to Section 1-4-7.)
6. Remove the sensor guide assembly. (Refer to Section 1-4-8.)
7. Remove the two claws and then remove the eject roller assembly.



8. Attach a new eject roller assembly in the reverse order of steps 1 to 7.

1-4-12. Photo Sensor

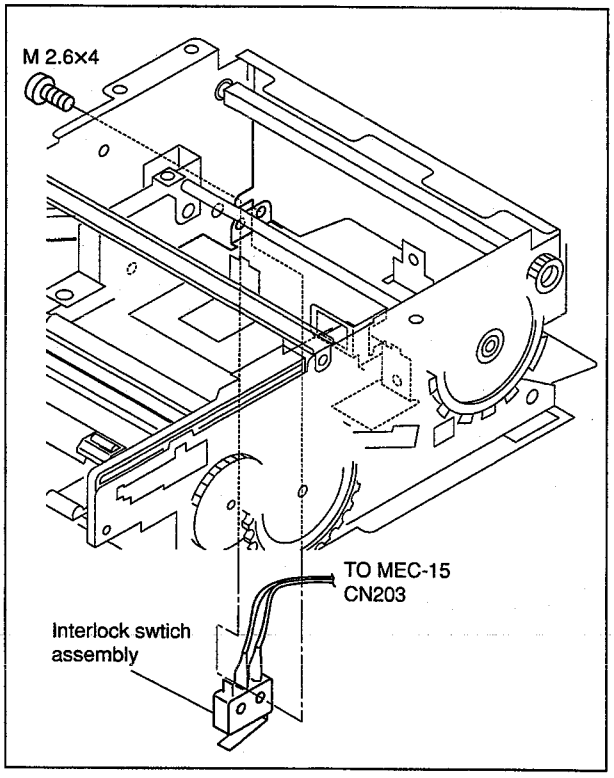
1. Remove the top cover. (Refer to Section 1-3-1.)
2. Remove the ribbon panel assembly. (Refer to Section 1-3-2.)
3. Remove the front panel assembly. (Refer to Section 1-3-3.)
4. Remove the mechanical deck assembly (Refer to Section 1-4-1.)
5. Disconnect one harness from the connector (CN105) on the MEC-15 board.
6. Remove the four claws from the mechanical deck chassis and then remove the photo sensor.



7. Attach a new photo sensor in the reverse order of steps 1 to 6.

1-4-13. Interlock Switch Assembly

1. Remove the top cover. (Refer to Section 1-3-1.)
2. Remove the ribbon panel assembly. (Refer to Section 1-3-2.)
3. Remove the front panel assembly. (Refer to Section 1-3-3.)
4. Remove the mechanical deck assembly (Refer to Section 1-4-1.)
5. Disconnect one harness from the connector (CN203) on the MEC-15 board.
6. Remove one screw and then remove the interlock switch assembly.



7. Attach a new interlock switch assembly in the reverse order of steps 1 to 6.

Note

When attaching the interlock switch assembly, make sure that the assembly is properly oriented.

Section 2
Electrical Alignment and Mechanical Alignment

2-1. Electrical Adjustment

2-1-1. Density Adjustment during Thermal Head Replacement

This mode is used when replacing the MEC-15 board, thermal head, power, and parts.

1. Density adjustment

The density must be adjusted during thermal head replacement.

(1) For the density adjustment, print test pattern STEP (V) in advance by the method below before replacing the head and extract a reference sample.
(2) After replacing the head, print STEP (V) again and adjust the head voltage so that the density is almost the same as that of the reference sample.
(3) When replace the MEC-15 board and thermal head, adjust the printing position of head direction. (Refer to Section. 2-1-1. item4)
(4) After head replacement and voltage adjustment, reset the number of estimated head print sheets.

2. Extraction of sample for density adjustment

(1) Set an ink ribbon and paper.
(2) Set the power switch to ON while pressing the [←] and [→] keys simultaneously. The printer then enters the service mode.
(3) Message "HIT ANY KEY" is displayed. Press any key.
(4) A menu is displayed.

```
PRINT TEST
      PRESS [EXEC]
```

(5) Press the [EXEC] key to start printing.
At that time, the printer controls the thermal head temperature until it reaches a proper temperature.
- When the head temperature is low: The printer performs preheating and starts printing after the head temperature reaches a proper temperature.
- When the head temperature is high: The printer performs cooling using a fan and starts printing after the head temperature reaches a proper temperature.

Note

If the head temperature is not proper, it may slightly take time to enter the print operation state after you press the [EXEC] key.

3. Head voltage adjustment

(1) Set the power switch to ON while pressing the [←] and [→] keys simultaneously. The printer then enters the service mode.
(2) Message "HIT ANY KEY" is displayed. Press any key.
(3) A menu is displayed.
(4) Press the [↑] and [↓] keys to display "HEAD V:".
(5) Press the [←] and [→] keys to increase or decrease the head voltage parameter. Next, press the [EXEC] key to define the setting.

Notes

- The head voltage does not change if you do not press the [EXEC] key.
- By decreasing the parameter, the head voltage decreases and the density also decreases. By increasing the parameter, the head voltage increases and the density also increases. This parameter does not directly represent the head applied voltage value.
- When "2. THERMAL & EEPROM CHECK 01" executes under the mechanical adjustment state, clear the head voltage adjustment to default setting. Therefore, above adjustment must be performed again.

4. Printing position adjustment of head direction

Notes

- Printing position adjustment performs when replacing IC102 on the MEC-15 board and thermal head.
- The following adjustment must be performed if printout result is not center position on the sheet as to head direction.
- When "2. THERMAL & EEPROM CHECK 01" executes under the mechanical adjustment state, clear the printing position adjustment. Therefore, following adjustment must be performed again.

(1) Set the power switch to ON while pressing the [←] and [→] keys simultaneously. The printer then enters the service mode.
(2) Message "HIT ANY KEY" is displayed. Press any key.
(3) A menu is displayed.
(4) Press the [↑] and [↓] keys to display SVC1/SVC2/SVC3.
Press the [←] and [→] keys to move SERVICE MENU2.
(5) Press the [↑] and [↓] keys and message then "P H SHIFT" is displayed, adjust so that the printing image becomes nearly center position on the print sheet by pressing the [←] and [→] keys.
   - When image size is S and increase the numeral value, move the image to left side on the LCD display.
   - When image size is S and decrease the numeral value, move the image to right side on the LCD display.

5. Resetting the number of estimated head print sheets

(1) Set the power switch to ON while pressing the [←] and [→] keys simultaneously. The printer then enters the service mode.
(2) Message "HIT ANY KEY" is displayed. Press any key.
(3) A menu is displayed.
(4) Press the [↑] and [↓] keys to display "HEAD PRN:".
(5) Press the [CLEAR] key while pressing the [EXEC] key. The number of estimated print sheets is then reset.

2-1-2. Output of Test Pattern (Internal Signal) in Service Mode

(1) Set the power switch to ON while pressing the [←] and [→] keys simultaneously. The printer then enters the service mode.
(2) Message "HIT ANY KEY" is displayed. Press any key.
(3) A menu is displayed.
(4) Press the [↑] and [↓] keys to display "PATTERN" when printing other patterns.
(5) Press the [←] and [→] keys to display the required test pattern name.
(6) Press the [PRINT] key to start printing.

Note

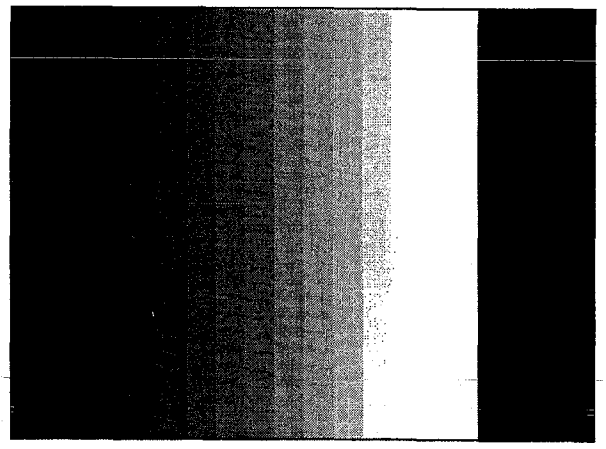
At that time, the printer does not control the thermal head temperature. The printer immediately enters the print operation when you press the [PRINT] key.

Notes

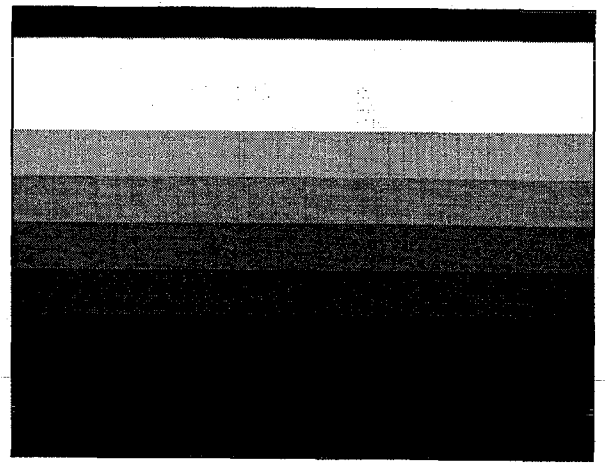
- In the state where an error (e.g., no paper or no ribbon) exists, the printer operates with the error displayed. In this case, press the [MENU] key, then press the [←] and [→] keys to display a service menu. Next, perform each operation described above.
- This test pattern cannot be output in the state where MULTI PIX is set to "2". When MULTI PIX is other than "1", a white frame may be put into the print result of a test pattern. In this case, set MULTI PIX to "1", then print.

There are several types of test patterns. Four standard patterns are as shown below.

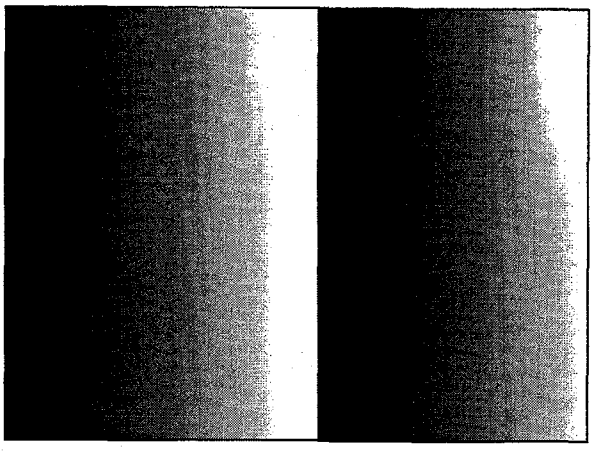
① STEP (H)



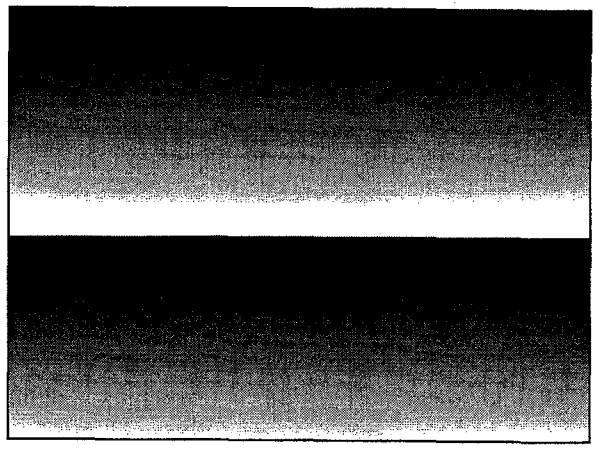
② STEP (V)



③ RAMP (H)



④ RAMP (V)



2-1-3. Electrical Adjustment (Analog Video Block)

This section describes regarding of the analog video signal adjustment.
The following adjustment must be performed when replace the VPR-74 board.

Preparation

1. Composite video signal
   75% FULL FIELD color bars (WHITE REF 100IRE)
2. S video signal
   75% FULL FIELD color bars
3. RGB signal
   WINDOW (WHITE 100IRE)

Entering the adjustment mode

- Set the power switch to ON while pressing the [←] and [→] keys simultaneously and start the printer in the service mode.
- Display "SERVICE MENU3".

```
SERVICE MENU3
 /SVC2/SVC3/SVC4
 IRE          : 100/11/12/13
 AGC          : OFF/ON
 VA ADJUST    : OFF/ON
 INPUT SEL    : V/SV/RGB
 PICTURE      : 33
 G-DRIVE      : 28
 B-DRIVE      : 28
 SUB-BRIGHT   : 14
 VBS Y        : A1
Q01A              1              S
```

* The italic character varies depending on the adjustment value.

Entering the "VA ADJUST" mode

Move the cursor to the "VA ADJUST" position and set it to "ON" position. The printer then enters the "VA ADJUST" mode. In this state, no signal is displayed on the monitor. Set it to "OFF" position to cancel the mode.

Cautions during adjustment

- Before adjustment, return all user adjustment items (including "COLOR ADJUST") to the center position.
- Adjustment is performed in the SOURCE output mode unless otherwise specified.

1. INT 4Fsc adjustment (NTSC)

Conditions for adjustment	Spec.	Adjustment
1. SOURCE/MEMORY: MEMORY 2. NTSC/PAL: NTSC	TP405 (G-6): 14 M 1,431,818 ±80 Hz	⊘CT401(F-7): 14.3

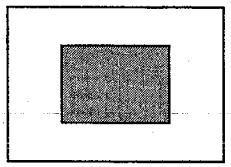
2. INT 4Fsc adjustment (PAL)

Conditions for adjustment	Spec.	Adjustment
1. SOURCE/MEMORY: MEMORY 2. NTCS/PAL: PAL	TP404(F-6): 17M 1,773,447.5 ±80.0 Hz	⊘CT403 (F-6): 17.7

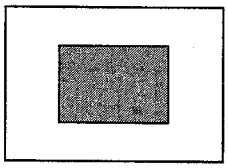
3. INT 4Fsc adjustment (PAL)

Conditions for adjustment	Spec.	Adjustment
1. SOURCE/MEMORY: MEMORY 2. NTCS/PAL: PAL	TP406 (F-7): VCO DC 2.0 ±0.2 Vdc	⊘CT402 (F-7): 14.1

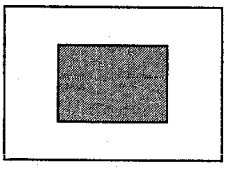
4. Picture adjustment

Conditions for adjustment	Spec.	Adjustment
1. VA ADJUST MODE 2. INPUT SELECT: RGB 3. AGC: OFF 4. NTSC/PAL: NTSC	Monitor  Adjust so that the red (or yellow, magenta, or white) in the diagonally striped portion is the maximum.	[SERVICE MENU3] [PICTURE:]

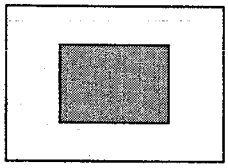
5. G-drive adjustment

Conditions for adjustment	Spec.	Adjustment
1. VA ADJUST MODE 2. INPUT SELECT: RGB 3. AGC: OFF 4. NTSC/PAL: NTSC	Monitor  Adjust so that the yellow (or white) in the diagonally striped portion is the maximum.	[SERVICE MENU3] [G-DRIVE:]

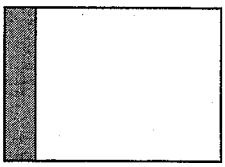
6. B-drive adjustment

Conditions for adjustment	Spec.	Adjustment
1. VA ADJUST MODE 2. INPUT SELECT: RGB 3. AGC: OFF 4. NTSC/PAL: NTSC	Monitor  Adjust so that the white in the diagonally striped portion is the maximum.	[SERVICE MENU3] [B-DRIVE:]

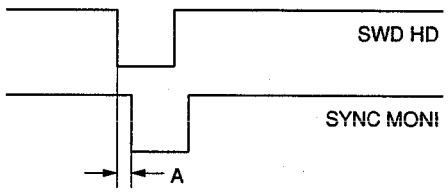
7. AGC REF adjustment

Conditions for adjustment	Spec.	Adjustment
1. VA ADJUST MODE 2. INPUT SELECT: RGB 3. AGC: ON 4. NTSC/PAL: NTSC	Monitor  Adjust so that the white in the diagonally striped portion is the maximum.	[SERVICE MENU3] [SUB-BRIGHT:]

8. VBS Y adjustment

Conditions for adjustment	Spec.	Adjustment
1. VA ADJUST MODE 2. INPUT SELECT: VIDEO SIGNAL: COLOR BAR 3. AGC: OFF 4. NTSC/PAL: NTSC	Monitor  Adjust so that the white in the diagonally striped portion is the maximum.	[SERVICE MENU3] [VBS Y:]

9. H position adjustment

Conditions for adjustment	Spec.	Adjustment
1. INPUT SELECT: VIDEO 2. INPUT SIGNAL: COLOR BAR	TP402 (C-5): SWD HD TP410 (A-5): SYNC MONI  A = 100 ±100 nS	⊘RV201 (D-7): H POSI

2-2. Mechanical Adjustment

2-2-1. Mechanical Adjustment Mode

In this mode, the adjustment of the sensors installed in a mechanical deck and the assembly of mechanical parts are confirmed. The confirmation is carried out when replacing the mechanical deck parts.

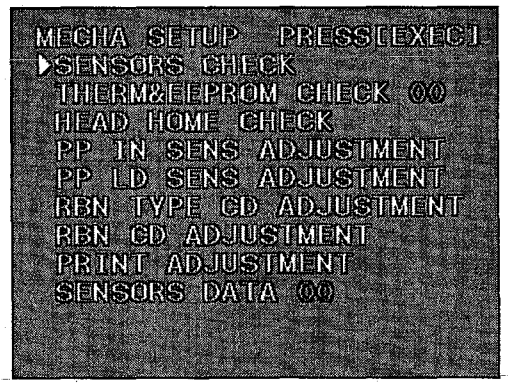
Notes

- Various information items of a mechanical deck are stored in IC102 on the MEC-15 board. Be sure to perform all mechanical adjustment after IC102 and MEC-15 board are replaced.
- The cleaning ribbon set (UPC-21CLN) supplied with this unit is required during adjustments of RBN TYPE and RBN CD sensors.

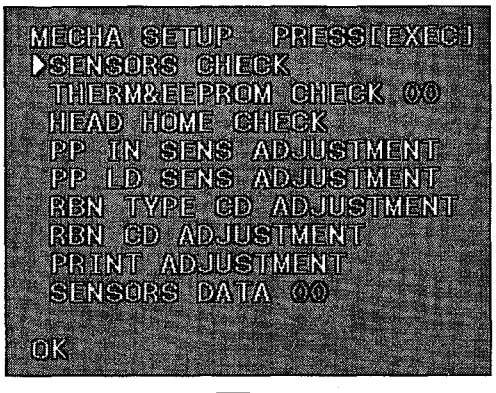
2-2-2. Entering the Mechanical Adjustment Mode

1. Turn on the power while pressing the [DISPLAY] and [EXEC] keys simultaneously. (Continue pressing them until MECHA JIG MODE appears on the LCD display.)
2. The "MECHA SETUP" menu in the mechanical adjustment mode appears on the screen (or LCD display).

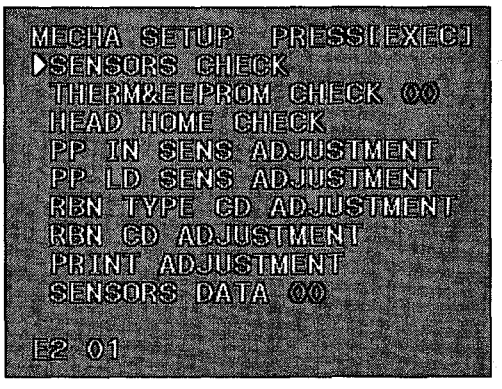
[MECHA SETUP menu]



[For OK]



[For NG]



3. Press the [↑] and [↓] keys, move the cursor to the item to be adjusted or checked, and then press the [EXEC] key.

4. Adjustment and check are automatically performed by the mechanical deck. After the adjustment and check are completed, the result appears on the screen (or LCD display).
5. When "OK" is displayed, adjustment and check are completed normally. When abnormality is checked, an error code is displayed. (Take measures referring to the NG_CODE table (at the end of this manual)).
6. To exit the mechanical adjustment mode, turn on the power again.

2-2-3. Normal Operation Check and Automatic Adjustment

1. SENSORS CHECK

Contents

- Is communication between boards possible?
- Operation check of each PAPER_JAM (S10), PAPER_EJECT (S11) and DOOR sensors.
- Does the sensor of the item to be checked operate normally? (Refer to NG_CODE2.)
- Are harnesses and mechanical parts connected properly?

Procedure

(1) Pull out the ribbon cartridge and paper tray, open the front panel.
(2) Move the cursor to the desired item and press the [EXEC] key.

Display

- OK: OK
- NG: NO ANSWER (If NO ANSWER is displayed, SCI communication with IC103 of the SY-299 board is impossible. Therefore, the subsequent adjustment and check cannot be carried out.)
  NG command (E2) and NG data (**)(One-byte data is displayed using a hexadecimal code. The hexadecimal code is converted into a binary code, and the bit whose "1" is set indicates the location where NG occurs. Refer to NG_CODE2.)

2. THERMAL & EEPROM CHECK

Contents

- Does IC102 on the MEC-15 board operate normally? (The number of estimated sheets or the sensor information is stored in IC102.)
- Do the thermistor of a thermal head, and the thermistor (THP201) on the MEC-15 board operate normally?
- Are harnesses and mechanical parts connected properly?

Procedure

(1) Move the cursor to the desired item, press the [←] and [→] keys to select the item, and then press the [EXEC] key.

When the display number is 00:	Check the thermistor and EEPROM operation. (The contents remain unchanged.)
When the display number is 01:	Check the thermistor and clear the contents of EEPROM (*).
* Contents to be cleared:	Number of estimated sheets, number of estimated head sheets, ShiftH, ShiftV, error history, head voltage parameter, and sensor information

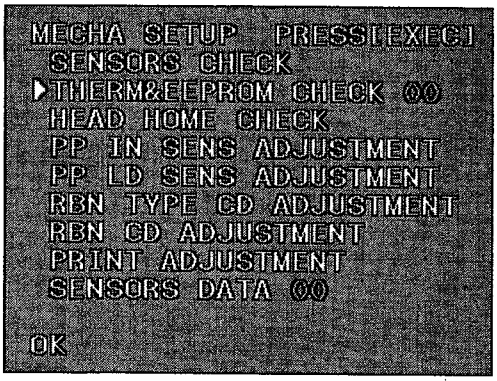
Note

Be sure to adjust it by display number 01 when replacing the MEC-15 board or IC102 newly.

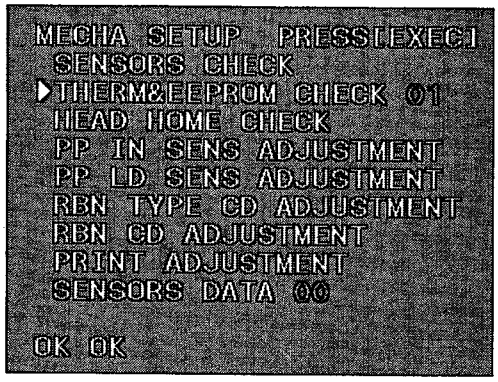
Display

- OK: 00: OK
  01: OK OK
- NG: NG command (E3) and NG data (**)(One-byte data is displayed using a hexadecimal code. The hexadecimal code is converted into a binary code, and the bit whose "1" is set indicates the location where NG occurs. Refer to NG_CODE3.)

[OK display in case of 00]



[OK display in case of 01]



3. HEAD HOME CHECK

Contents

- Does the head position sensors (S8 and S9) operate normally?
- Does the DC motor operate?
- Are harnesses and mechanical parts connected properly?

Procedure

(1) Pull out the ribbon cartridge and paper tray.

(2) Move the cursor to the desired item and press the EXEC key.

Display

- OK: OK
- NG: NG command (E1) and NG data (**)(One-byte data is displayed using a hexadecimal code. The value of the hexadecimal code is an NG item. Refer to NG_CODE1.)

4. PP IN SENS (S1) ADJUSTMENT

Contents

- Automatic light-emitting level and threshold level adjustments of PP IN (PAPER IN) sensor
- Are harnesses and mechanical parts connected properly?

Procedure

(1) Insert the paper tray with print papers.

(2) Move the cursor to the desired item and press the EXEC key.

Display

- OK: OK
- NG: NG command (E4) and NG data (**)(One-byte data is displayed using a hexadecimal code. The hexadecimal code is converted into a binary code, and the bit whose "1" is set indicates the location where NG occurs. Refer to NG_CODE4.)

5. PP LD SENS (S2) ADJUSTMENT

Contents

- Automatic light-emitting level and threshold level adjustments of PP LD (PAPER LOAD) sensor
- Are harnesses and mechanical parts connected properly?

Notes

- For the mechanical deck labeled of initial serial numbers, print paper may be jammed during paper delivery after adjustment. Therefore, the following adjustment must be performed using automatic adjustments.
- PP IN and PP LD sensors adjustments can be performed automatically during PRINT ADJUSTMENT and normal printing conditions. This may be adjusted automatically when normal printing at a first during set the power switch to ON again and executing of PRINT ADJUSTMENT after 2. THERM & EEPROM CHECK 01 is performed.

Procedure

(1) Insert the paper tray with print papers.
(2) Move the cursor to the desired item and press the EXEC key.

Display

- OK: OK
- NG: NG command (E4) and NG data (**) (One-byte data is displayed using a hexadecimal code. The hexadecimal code is converted into a binary code, and the bit whose "1" is set indicates the location where NG occurs. Refer to NG_CODE4.)

6. RBN TYPE CD (S5 to S7) ADJUSTMENT

Contents

- Automatic light-emitting level and threshold level adjustments of RBN TYPE0, 1, 2 (RIBBON TYPE) sensors.
- Are harnesses and mechanical parts connected properly?

Procedure

(1) Insert a cleaning ribbon cartridge.
(2) Move the cursor to the desired item and press the EXEC key.

Display

- OK: OK
- NG: NG command (E5) and NG data (**) (One-byte data is displayed using a hexadecimal code. The hexadecimal code is converted into a binary code, and the bit whose "1" is set indicates the location where NG occurs. Refer to NG_CODE5.)

7. RBN CD (S3) ADJUSTMENT

Contents

- Automatic light-emitting level and threshold level adjustments of RBN CD sensor
- Does the ribbon motor operate?
- Are harnesses and mechanical parts connected properly?

Procedure

(1) Insert a cleaning ribbon cartridge.
(2) Move the cursor to the desired item and press the EXEC key.

Display

- OK: OK
- NG: NG command (E4) and NG data (**) (One-byte data is displayed using a hexadecimal code. The hexadecimal code is converted into a binary code, and the bit whose "1" is set indicates the location where NG occurs. Refer to NG_CODE4.)

8. PRINT ADJUSTMENT

Contents

- Automatic light-emitting level and threshold level adjustments of PP IN and PP LD sensors
- Does irregular printing occur by the thermal head or gear?
- Is an error found in the path system of paper?
- Are harnesses and mechanical parts connected properly?

Note

Automatic adjustments of PP IN and PP LD sensors are operated when normal printing condition at a first during set the power switch to ON again and executing of PRINT ADJUSTMENT after 2.THERM & EEPROM CHECK 01 is performed.

Procedure

(1) Insert a ribbon cartridge and paper tray.

(2) Move the cursor to the desired item and press the [EXEC] key.

Display

- OK: OK
- NG: NG command and NG data (H '**) (One-byte data is displayed using a hexadecimal code. The value of the hexadecimal code is an NG item. Refer to NG_CODE4.)

9. SENSORS DATA

Contents

- The adjustment values (light-emitting level value, high-level value, low-level value, and threshold level value) of automatically adjusted six sensors are displayed.
- Trouble historical information of mechanical deck (The error information that occurred during mechanical operation is read. Up to the last eight information items are stored. The contents of information correspond to the NG_CODE1 data. Press the [CLEAR] key to clear data. When clearing is completed, OK is displayed.)

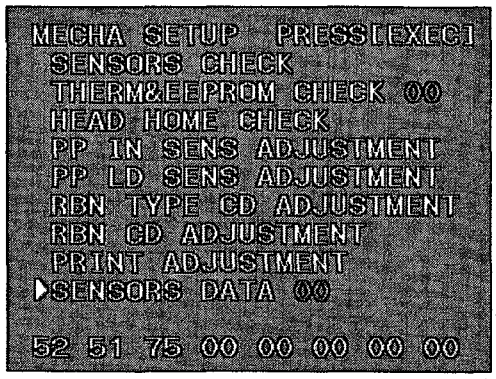
Procedure

Move the cursor to the desired item, press the [←] and [→] keys to select the item, and then press the [EXEC] key.

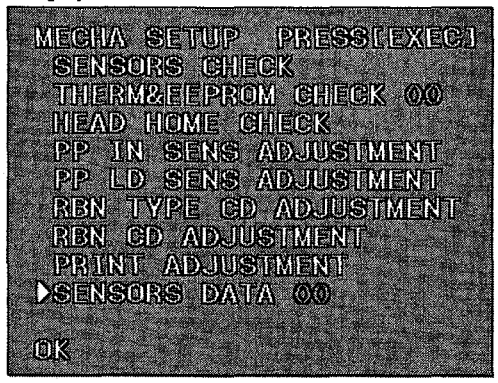
When display number is 00: Trouble historical information

For 01: PP IN (S1) sensor	For 04: RBN TYPE0 (S5) sensor
For 02: PP LD (S2) sensor	For 05: RBN TYPE1 (S6) sensor
For 03: RBN CD (S3) sensor	For 06: RBN TYPE2 (S7) sensor

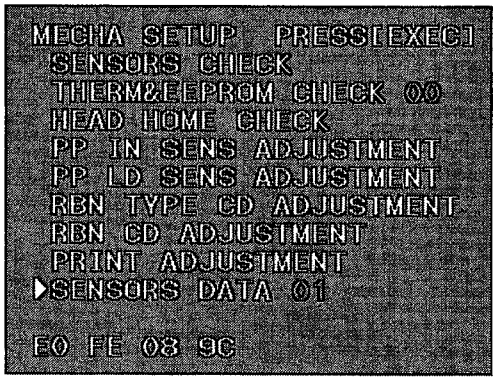
[Display example of trouble historical information]



[Display after trouble historical information is cleared]



[Display example of sensor data]



Viewing the display of sensor adjustment value

(Example) 84 f5 0f 80

One-byte data is displayed using a hexadecimal code. In each sensor, data is arranged in the order of "light-emitting level value", "high-level value", "low-level value", and "threshold level value" from the beginning.

(For the data described above, the LED voltage value is 84, the high-level value of PHTR is f5, the low-level value of PHTR is 0f, and the threshold level value is 80.)

Converting the displayed data into the voltage value of a sensor

The displayed data indicates the value obtained when the voltage level (0 to 5.0 V) of each sensor is divided by 256. Therefore, the voltage value indicated using a hexadecimal code is obtained from the calculation below.

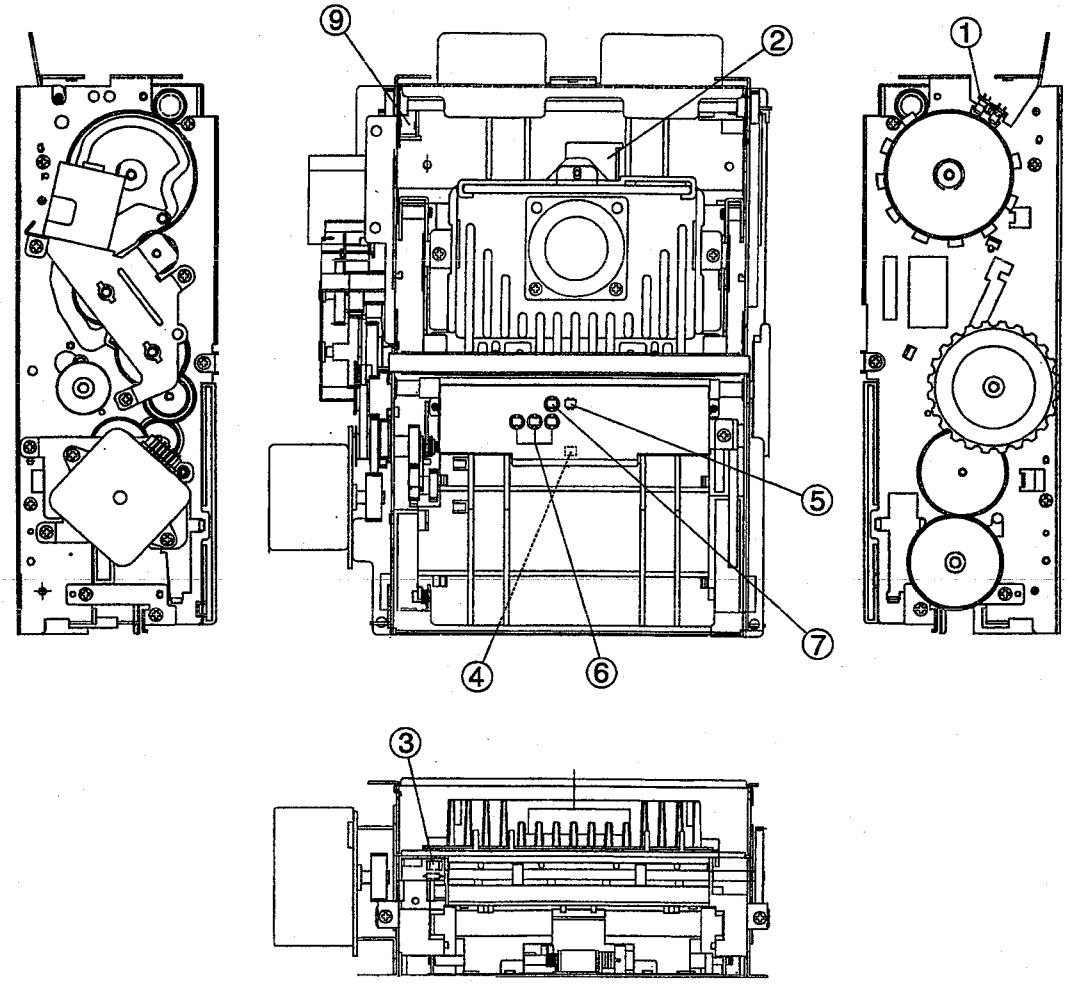
(Example) When the hexadecimal code is H 'b3:

H 'b3 = D' 179 (← The hexadecimal display is converted into a decimal display.)

5.0 (v) × 179/256 = 3.4 (v) (← Voltage value of sensor indicated by H 'b3)

Section 3
Sensor Arrangement and Functional Description

No.	Name	Type of sensor	Function
1	Head position sensor (S8, S9)	Photo Interrupter	Detects the up/down position of the head
2	Jamming sensor (S10)	Photo Interrupter	Detects the paper end
3	Delivery flap sensor (S11)	Photo Interrupter	Detects the amount of delivery
4	Paper-in sensor (S1)	Reflector	Detects the paper exists or not into the paper feed tray
5	Paper feed sensor (S2)	Reflector	Defects the paper extremity
6	Ribbon type detection sensor (S5-S7)	Reflector	Detects the type of the ribbon
7	Ribbon cueing sensor (S3)	Reflector	Detects the cue of the ribbon
8	Front panel opening detection	Mechanical	Detects the opening/closing of the front panel
9	Interlock sensor	Mechanical	Detects the installing of the bottom cover on the unit



Notes

- Front panel opening detection sensor at No.8 is mounted on the SE-642 board. Regarding to arrangement of the SE-642 board, refer to "1-1. Board Location".
- For more details of each sensor, refer to "4-3-4. Outline of Sensor Detection Circuits".

Section 4
Circuit Operation Description

4-1. Digital Video Signal Processing Block

4-1-1. Outline

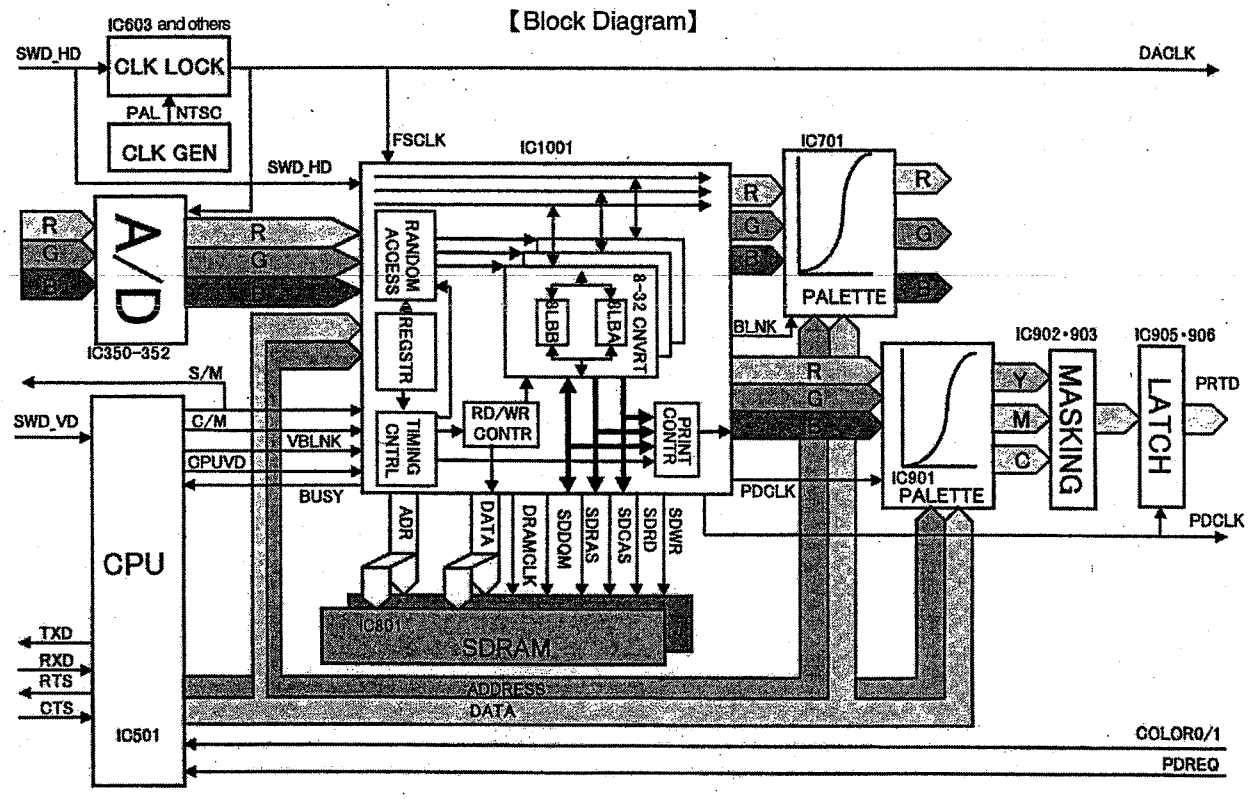
The main functions of the digital signal processing block on the VPR-74 board are as follows:

1. Converts a video input signal from analog to digital and stores it in memory (DRAM). (Capture)
2. Color-adjusts the image data stored in memory using a color adjustment circuit, and then converts the data from digital to analog and outputs it to the analog signal processing block on the VPR-74 board as a monitor output signal. (Monitor output)
3. Color-adjusts the image data stored in memory using a color adjustment circuit and then outputs it to the head control block through a masking block as print data. (Print data output)
4. Converts a video input signal from analog to digital, converts the signal from digital to analog as it is, and outputs it to the analog signal processing block as a monitor output signal. (Source output)

The digital signal processing block on the VPR-74 board consists of the following blocks.

- CPU block
- Memory (DRAM) block
- Memory control (ASIC) block
- Sampling clock generation block
- Color adjustment block
- Masking block

【Block Diagram】



4-1-2. Flow of Image Signal in Each Operating Mode

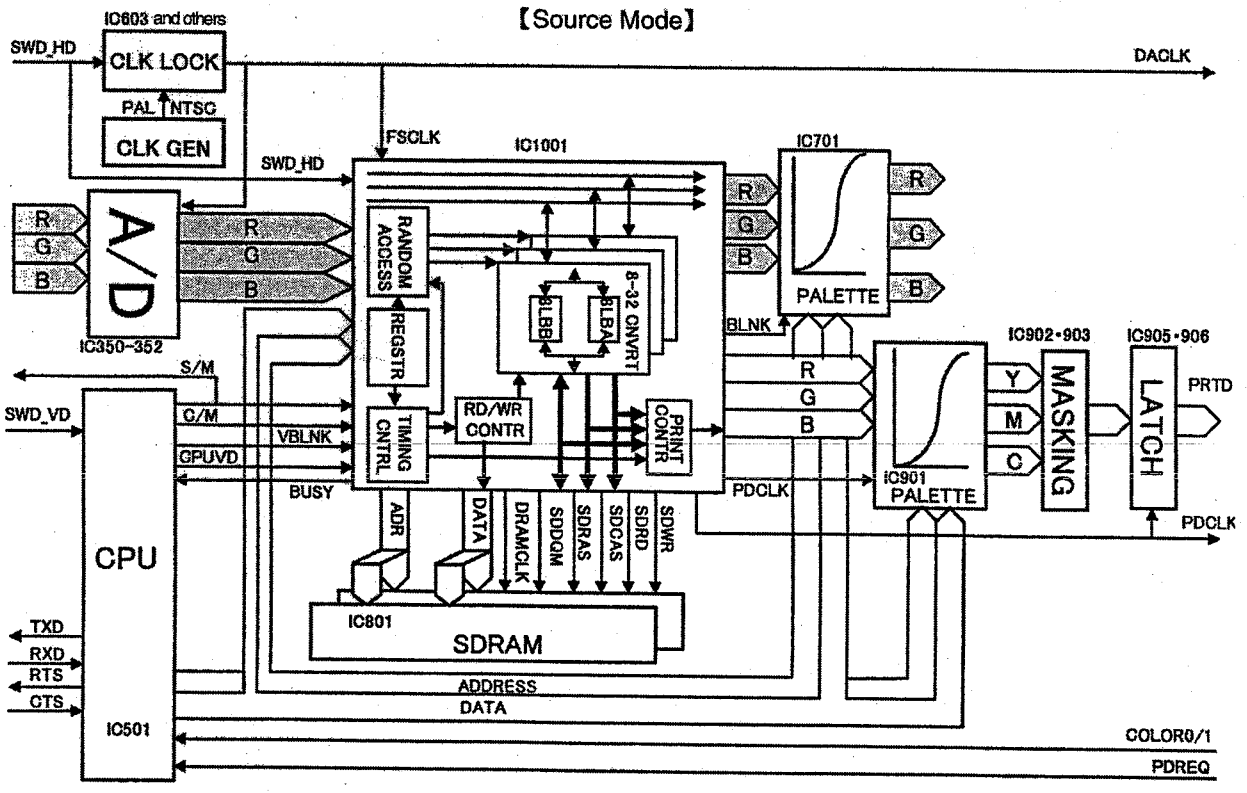
The operating mode on the flow of an image signal in a digital signal processing block can be classified into the following four modes.

- Source mode
- Memory mode
- Capture mode
- Print data transfer mode

Source mode

In this mode, a video input signal is directly output to the monitor via a digital signal processing block. The flow of an image signal is as described below.

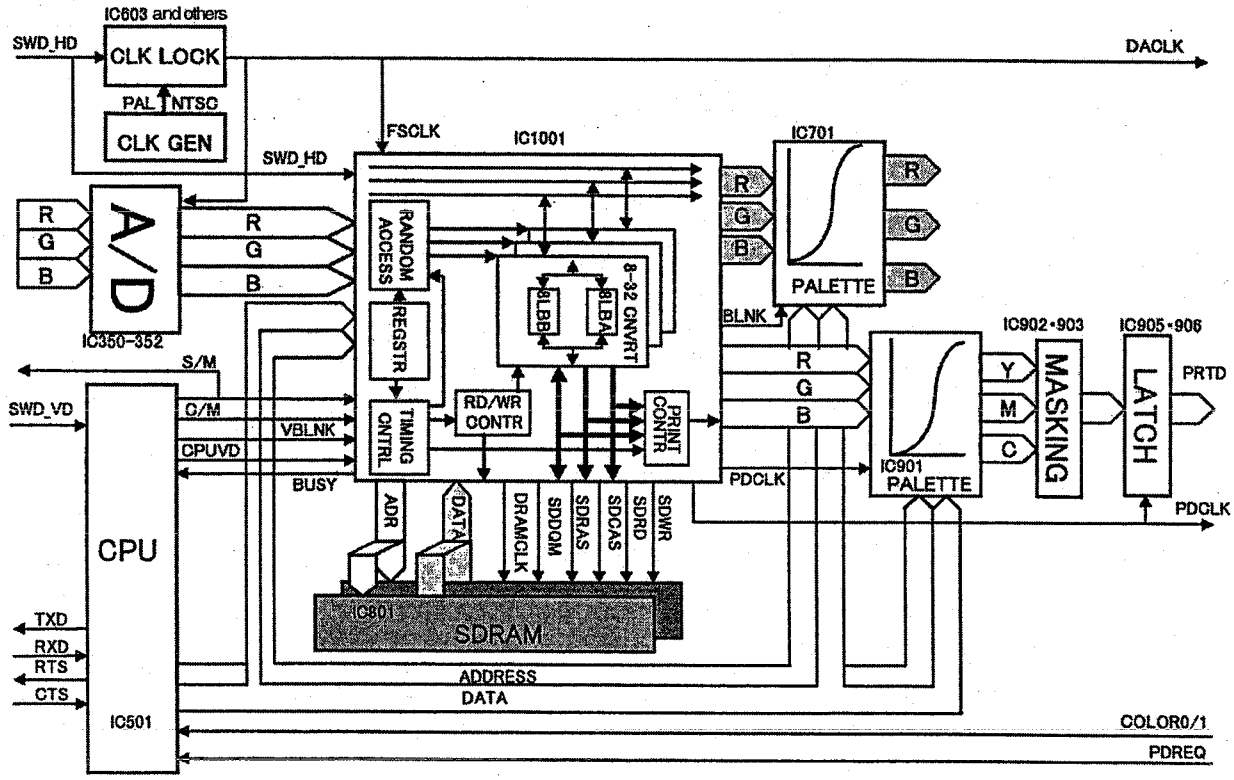
The RGB analog signal input from an analog signal processing block is converted from analog to digital as an eight-bit digital signal, respectively. This signal is passed through a DRAM control circuit (IC1001) and adjusted in color using a color adjustment circuit (IC701). After that, the image size is adjusted by the blanking produced using a CPU and DRAM control circuit. The resultant signal is converted from digital to analog again as an analog signal and output to the analog signal processing block.



Memory mode

In this mode, the image data fetched into DRAM is output to the monitor.
The flow of an image signal is as described below.
The digital image data fetched into DRAM is read using a DRAM control circuit (CXD9111R: IC1001) and converted from 32 bits to 8 bits. After that, the image data is adjusted in color using a color adjustment circuit (IC701), and the image size is adjusted by the blanking produced using a DRAM control circuit. The resultant data is converted from digital to analog and output to the analog signal processing block.

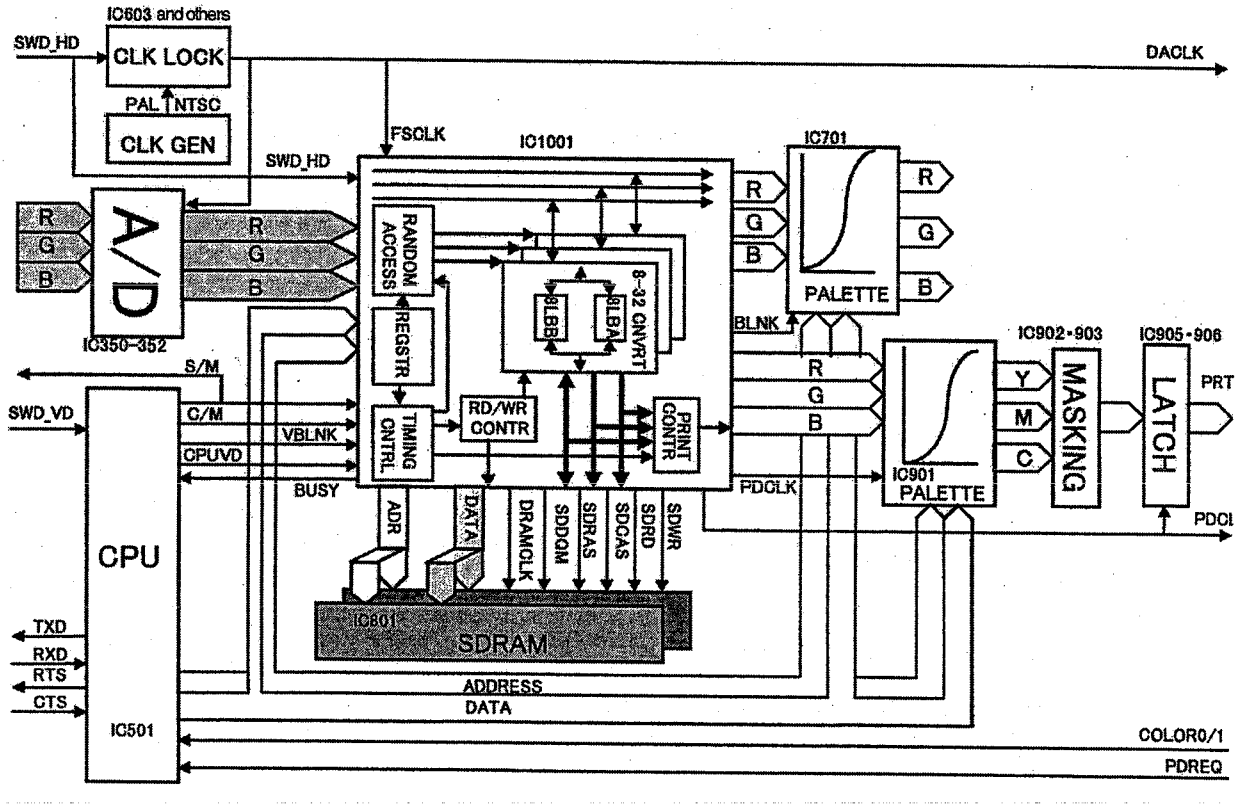
【Memory Mode】



Capture mode

In this mode, a video input signal is converted from analog to digital and fetched into DRAM.
The flow of an image signal is as described below.
The video signal input from an analog signal processing block is converted from analog to digital as an eight-bit digital signal. The converted video signal is converted from 8 bits to 32 bits in a DRAM control circuit (CXD9111R: IC1001), and expanded in DRAM.

【Capture mode】



Print data transfer mode

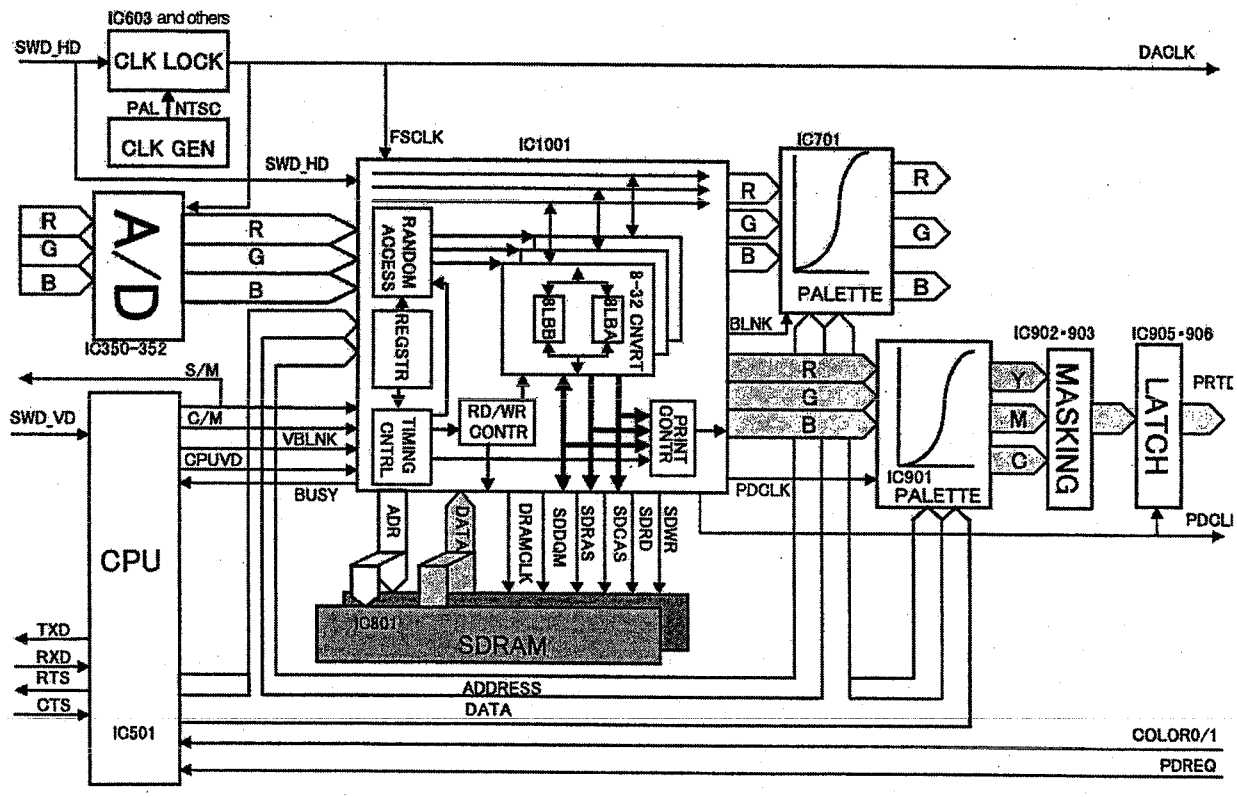
In this mode, the image data that exists in DRAM is output to the SY-299 board as print data during printing.

The flow of an image signal is as described below.

The data request signal from the SY-299 board is input to CPU (IC501).

The CPU controls a DRAM control circuit (CXD9111R: IC1001), and the DRAM control circuit converts the image data in DRAM into print data and outputs it. After that, the data is color-adjusted, color-rotated, and converted from RGB to YMC using a color adjustment circuit (IC901). Next, the data is masking-converted using two masking ROMs and output to the SY-299 board as print data.

【 Print Mode 】



4-1-3. Basic Operation Timing and CPU Block

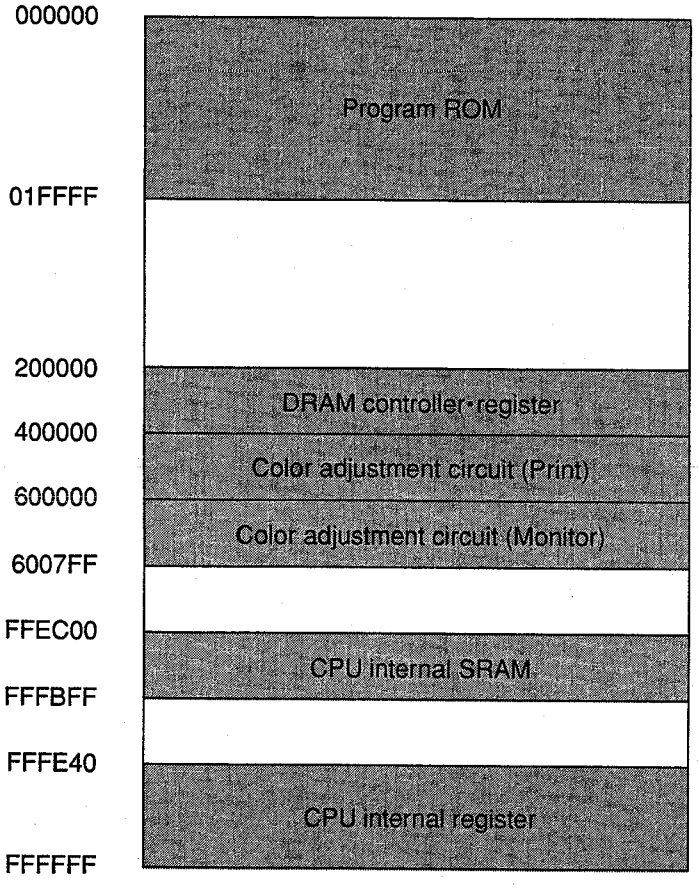
The operation of the digital signal processing block on the VPR-74 board is controlled and managed according to the command from the SY board by CPU.
CPU operates with the VD signal (SWD_VD) switched into EXT or INT as reference and performs each setting and control for a DRAM control circuit (CXD911R).

The main functions of a CPU block for digital signal processing are as follows:

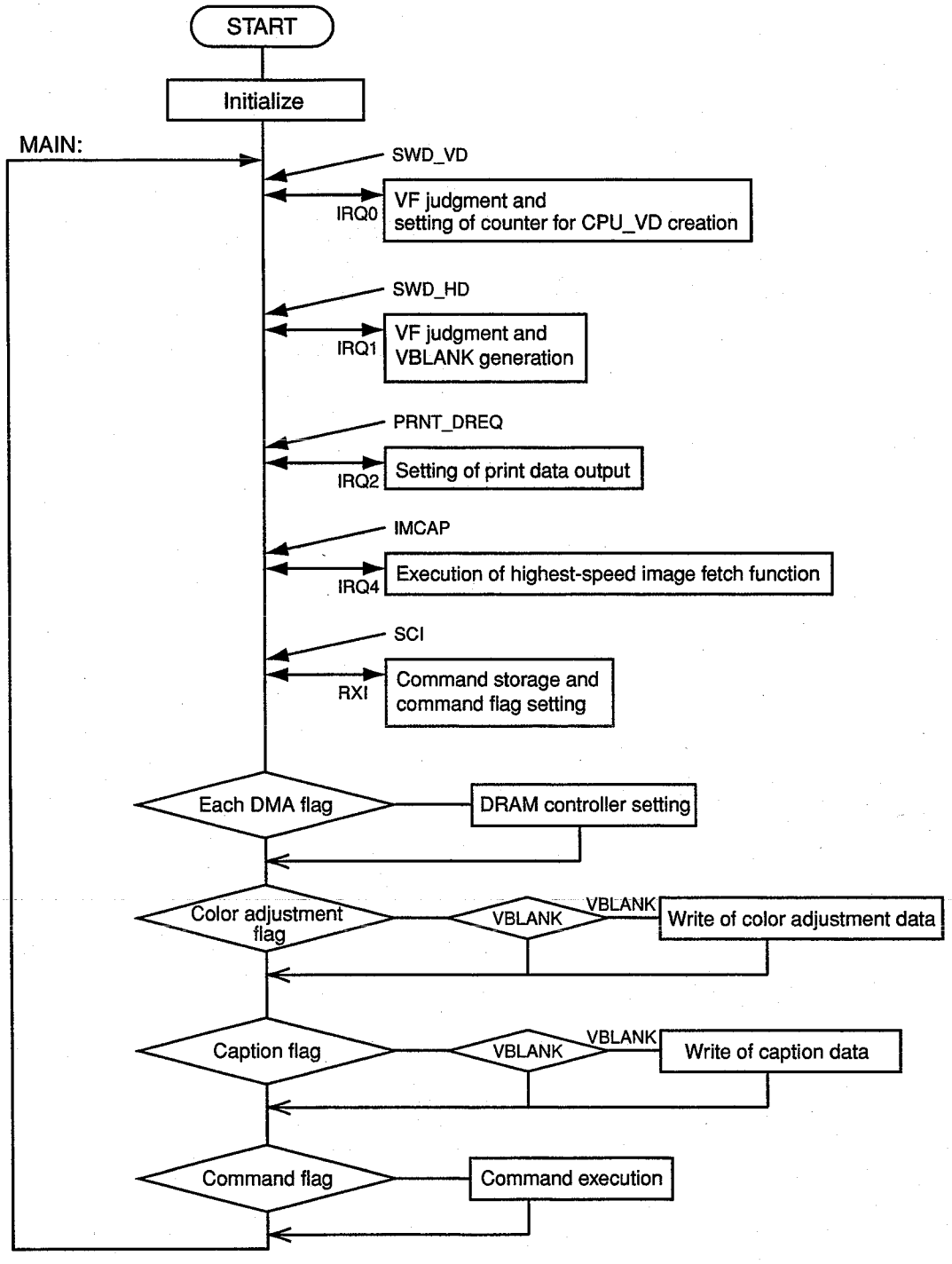
- Reception and execution of command from SY board
- VF judgment (synchronous management) of video input signal
- Output of blanking signal
- Control of DRAM control circuit
- Write of color adjustment data
- Write of caption data

CPU memory map

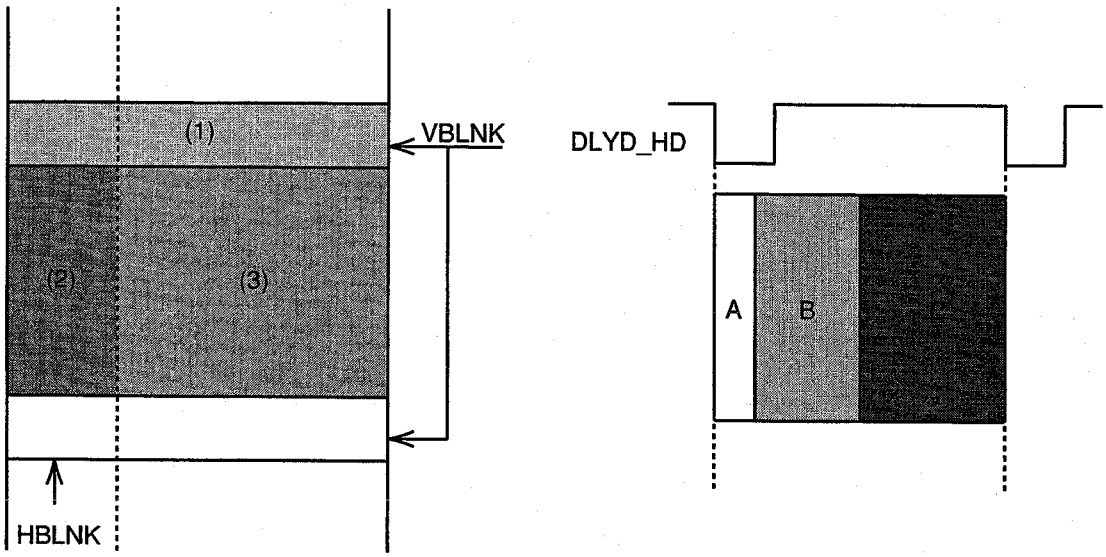
The memory map of CPU is shown below.



Flowchart of CPU



Time-sharing timing



(1) VBLNK period
- DRAM access
- VF judgment
- Write of color adjustment data

(2) HBLNK period
- DRAM access

(3) Effective screen period
- DRAM access
- Input and output of capture or monitor output image data

(A) DRAM refresh

(B) DRAM access of capture or monitor output image data

(C) Output of print data, and write or read of caption data

Command communication with SY board

The command communication with the SY board is performed by the bi-directional asynchronous serial communication in which the serial communication port of CPU is used.

Asynchronous serial communication

- Start bit: 1
- Data bit: 8
- Stop bit: 1
- Parity bit: None
- Baud rate: 19200 bps

Synchronous control

The external sync signals (EXT_VD and AFC_HD) and internal sync signals (OVD and OHD (IC406 CXD1217QN)) produced in an analog signal processing block are switched using an SRC/nMEM signal from CPU (IC501) and sent to the CPU and DRAM control circuit as a V sync signal (SWD_VD) and H sync signal (SWD_HD). The AFC_HD signal is AFC-processed in the analog signal processing block. If the AFC processing should be interrupted, the operation of a digital signal processing block is not guaranteed. The CPU to which the SWD_HD and SWD_VD sync signals were input compares each phase for VF judgment (frame judgment). This VF judgment performs processing so that the context is not lost even if a jitter slightly exists in the sync signals. Therefore, odd and even fields are not misplaced for capturing. The SWD_VD sync signal is also AFC-processed by the software in CPU. Even if noise is mixed in the SWD_VD sync signal, therefore, the noise component is canceled. A virtual VD signal is generated by CPU even if the SWD-VD signal is interrupted and even if the period is changed (CPU_VD). The CPU_VD signal is input to the DRAM control circuit.

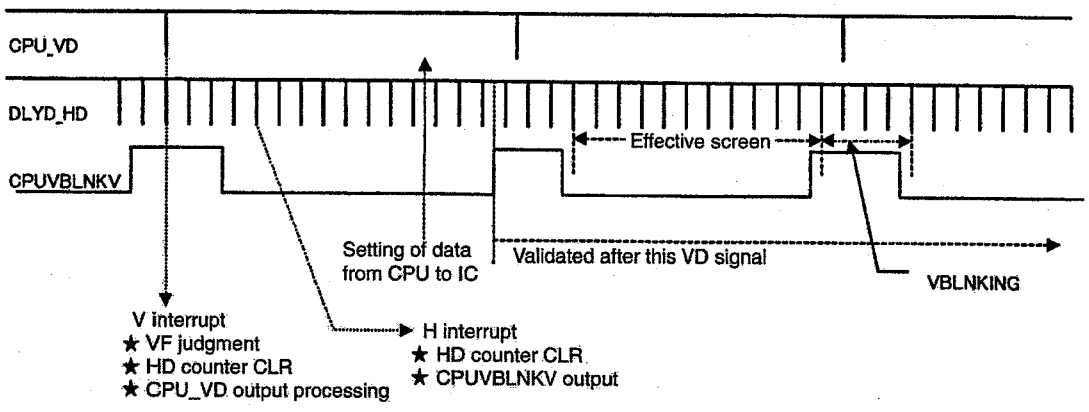
Output of blanking signal

The V blanking signal that determines the position of the effective screen in the vertical direction counts the falling of an SWD_HD signal after an SWD_VD signal is input to CPU, and it is output as a CPUVBLNKV signal. For the H blanking signal that determines the position of the effective screen in the horizontal direction, a BLNK signal is output as the blanking signal for input image data capture and memory image data monitor output operations by the setting value set to the control register of a DRAM control circuit and the input of a CPUVBLNKV signal.

Control of DRAM control circuit

- Capture operation
- Monitor output operation
- Print data output
- DRAM refresh operation
- Random access operation

To perform the operations described above, each mode is set to the register of a DRAM control circuit. The DRAM control circuit triggers VD and HD signals for operation.
Each setting is not restricted by video timing. The setting value is latched using a VD signal and validated after the VD signal.



Write of color adjustment data

The data for a conversion table is written in CXD8869Q (color adjustment circuit) during V blanking.

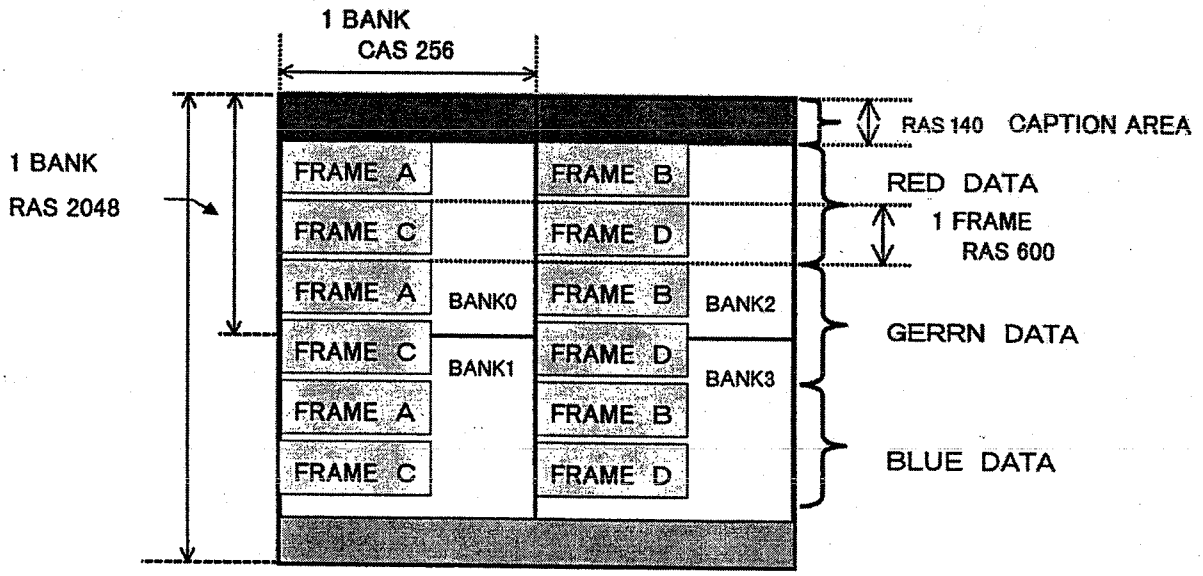
Write of caption data

Caption data is set to a DRAM control circuit so as to output an access trigger (RATRG). The DRAM control circuit expands the data on DRAM.

4-1-4. Memory (DRAM) Block

The memory of a four-frame uses 64M-bit SDRAM × 1.

The memory space is constituted by 600 (RAS) × 256 (CAS) × 32 bits for each color of one frame image memory. However, the memory space is apparently considered as 600 (RAS) × 1024 (CAS) × 8 bits during use by storing eight-bit image data proportionally to four-dot pixels (four-dot pixels in one address) in the direction of depth. The conversion of eight bits to 32 bits and vice versa is performed using a DRAM control circuit.



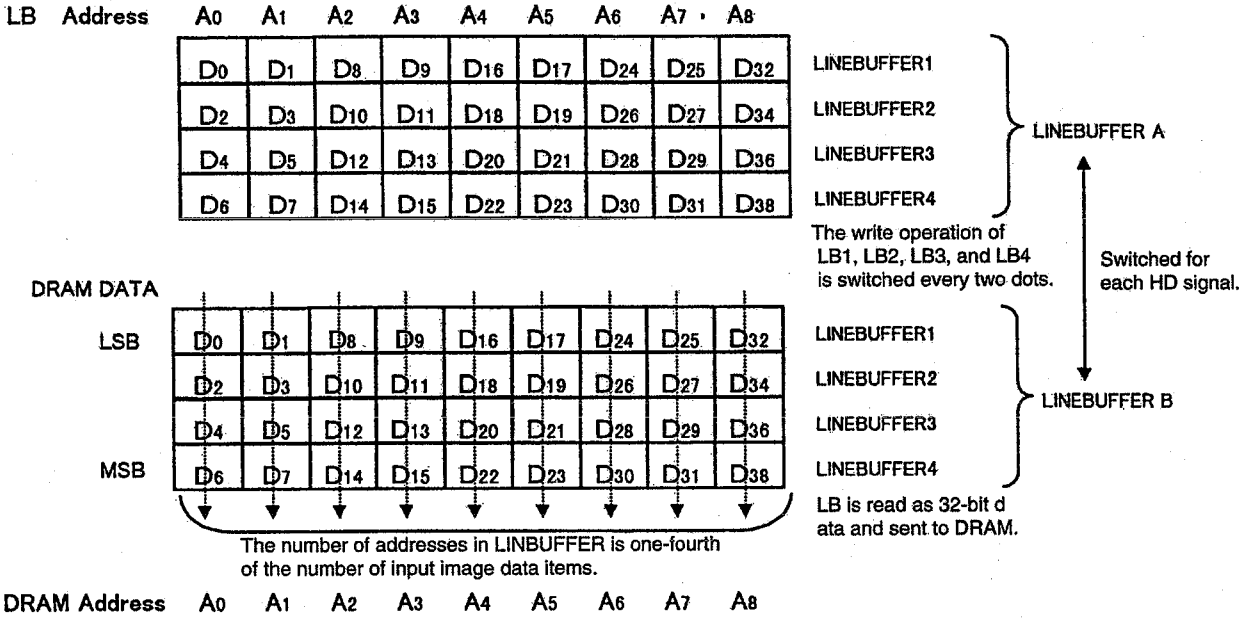
Memory Configuration (Four-Frame)

4-1-5. Memory Control Block

A four-dot pixel is stored in one address for high-speed processing using SDRAM of 32 bits in the direction of depth so as to double the apparent SDRAM access speed. This processing is performed using a standard cell circuit. The circuit is controlled by CPU.

Conversion of 8 bits to 32 bits and vice versa in case of input image data capture (FULL)

The eight-bit image data input to this circuit is stored in each line buffer in the order below.


LB Address A0 A1 A2 A3 A4 A5 A6 A7 A8
D0 D1 D8 D9 D16 D17 D24 D25 D32
D2 D3 D10 D11 D18 D19 D26 D27 D34
D4 D5 D12 D13 D20 D21 D28 D29 D36
D6 D7 D14 D15 D22 D23 D30 D31 D38
LINEBUFFER1
LINEBUFFER2
LINEBUFFER3
LINEBUFFER4
LINEBUFFER A
The write operation of LB1, LB2, LB3, and LB4 is switched every two dots.
Switched for each HD signal.
DRAM DATA
LSB
MSB
LINEBUFFER B
LB is read as 32-bit data and sent to DRAM.
The number of addresses in LINBUFFER is one-fourth of the number of input image data items.
DRAM Address A0 A1 A2 A3 A4 A5 A6 A7 A8

The main operation and setting of a DRAM control circuit are as follows:

- Various capture operations

FULL image
SPLIT 2 image
SPLIT 4 image
Capture shift size
Write DRAM address

By setting the items above, the DRAM control circuit automatically performs the capture operation in synchronization with VD and HD signals.

- Print data output operation

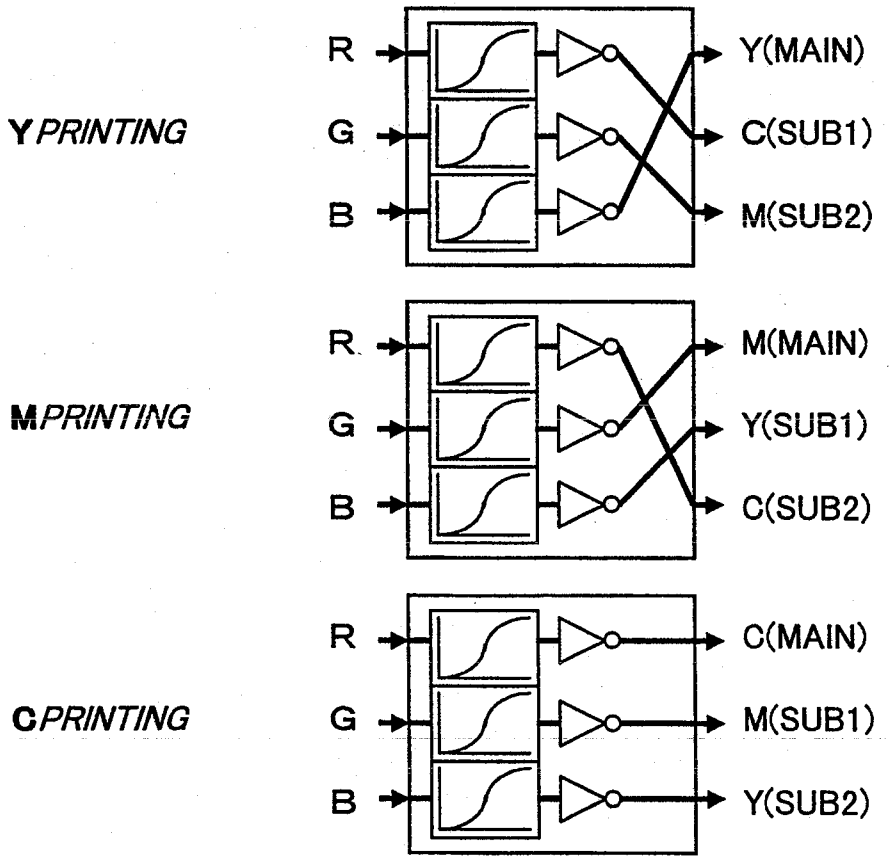
Number of output data items
Read DRAM address

The print data output operation is performed by setting the items above and by triggering from CPU.

• Various monitor output operations
FULL image
SPLIT 2 image (Decimated in the horizontal and vertical directions.)
4IN1 image (Equal to a SPLIT 2 image as IC operation.)
Monitor output shift size
Read DRAM address
By setting the items above, the DRAM control circuit automatically performs the monitor output operation in synchronization with VD and HD signals.
• Random access operation
Write DRAM address
Write data
The random access operation is performed by setting the items above and by triggering from CPU during V blanking period.
• DRAM refresh operation
Number of refresh access addresses
By setting the item above, the DRAM control circuit automatically performs the DRAM refresh operation. (RAS only refresh)

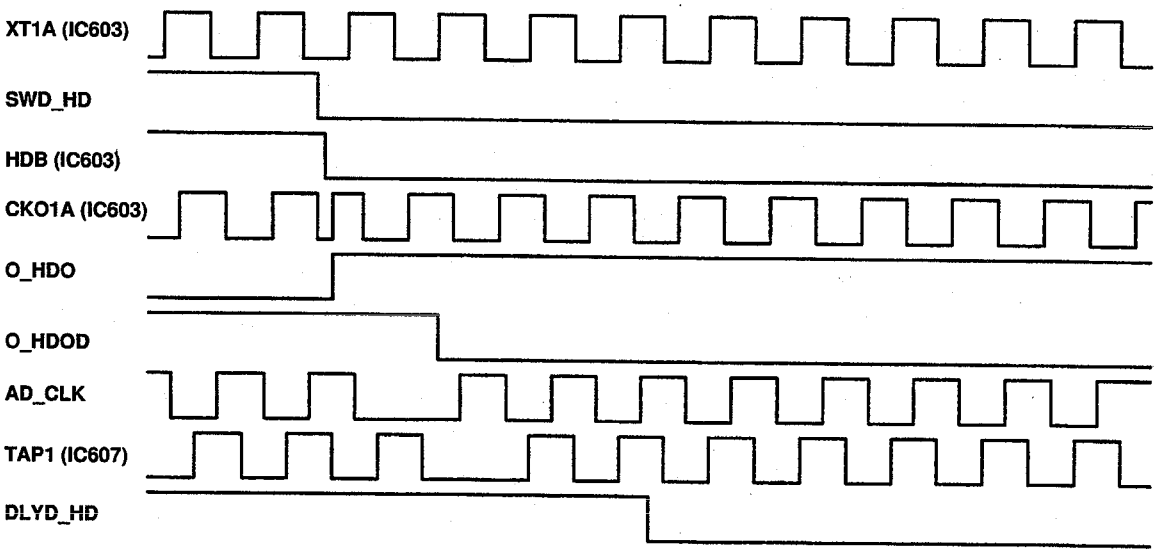
4-1-6. Color Adjustment Block

On the video side, the color of image data is adjusted using an SRAM conversion table in IC701 (CXD8869Q). On the print side, it is adjusted using a conversion table in IC901 (CXD8869Q). The table data is provided in the program ROM of CPU. On the video side, the table data is rewritten during V blanking period. On the print side, it is rewritten immediately before printing.
On the print side, the color rotation and RGB-YMC conversion of print data are also performed as well as color adjustment. The flow of data shown below is obtained according to the print color. CPU controls the print setting of each color by receiving the color information command.



4-1-7. Sampling Clock Generation Block

This block generates a sampling clock, locks the phase to the "high" level of external and internal sync signals, and distributes the clock to the DRAM control circuit or color adjustment circuit.
The clock frequency is 18.425196 MHz for NTSC and PAL in common.
The operation timing is shown below.



4-1-8. Masking Block

The masking block corrects the difference between the ideal reproduction color and the three primary colors (Y, M, and C) of printed materials using a two-ROM data conversion system of main masking ROM and sub-masking ROM.
The MAIN, SUB1, SUB2 and print color information signals output from a color adjustment circuit (on the print side) are input to the main and sub-masking ROMs. The data that was masking-corrected using a two-ROM conversion table is latched by IC905 and IC906 and output to the SY-299 board as eight-bit print data.

4-1-9. A/D and D/A Conversion Blocks

The A/D conversion block consists of three A/D converters (CXD1176Q IC350 to IC352). The analog RGB signal input from an analog signal processing block is clamped using a clamp pulse (nCLAMP signal) and adjusted in gain using a CLP_REF signal that is input to the VREF pin of an A/D converter.
In the D/A conversion block, an eight-bit digital RGB signal is converted into an analog video signal using an encoder (BH7243KV IC407) incorporating a three-channel D/A converter.

4-2. Analog Video Signal Processing Block

4-2-1. Outline

The analog video signal processing block mainly consists of the following two blocks.

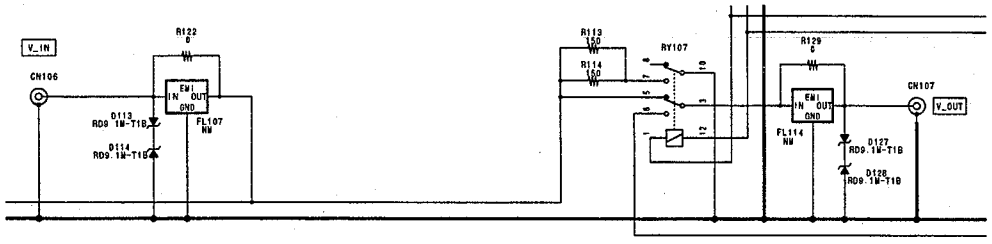
1. Interface block (IF-851 board)
   The interface block mounts a relay for THROUGH/EE selection.
   All video signals are input and output from and to the external equipment via this block.
2. Analog video signal processing block (Part of VPR-74 board)
   A part of the VPR-74 board consists of an analog video signal processing block.
   Moreover, this block can be mainly classified into a video decoder block (that fetches the input video signal into memory) and video encoder block (that monitors the digital video signal from memory).
   I²CBUS is almost used for the setting and adjustment of an analog video block. The analog video block is controlled by the SY-299 board.

The main functions of the analog video signal processing block are as follows:

- Selection of input signals (composite video, S video, and RGB signals)
- Conversion of composite video and S video signals into RGB signal (Decoding of video signal)
- AGC (Automatic Gain Control) for input signal
- User adjustments (HUE, COLOR, GAIN, OFFSET, MONITOR-RGB, etc.)
- OSD (On Screen Display) function
- Selection of monitor output signal (SOURCE/MEMORY)
- Sync signal processing (NTSC/PAL detection, signal detection, sync separation, and AFC)
- Conversion of RGB digital signal into composite video and S video signals (Encoding of video signal)

4-2-2. Interface Block (IF-851 Board)

A monitor output signal is switched into THROUGH or EE using this block. By using a mechanical relay, the monitor output of an input signal can be performed even if the power of this unit is off.



4-2-3. Analog Video Signal Processing Block (Part of VPR-74 Board)

1. Input signal processing block (Decoder block)

(1) SYNC ON GREEN discriminator circuit

This board mounts a discriminator circuit that separates a sync signal from a green channel when no sync signal is input at the time of an RGB signal input.

IC102 discriminates the existence of a sync input signal and controls a video switch (IC103) that switches green input and sync input signals.

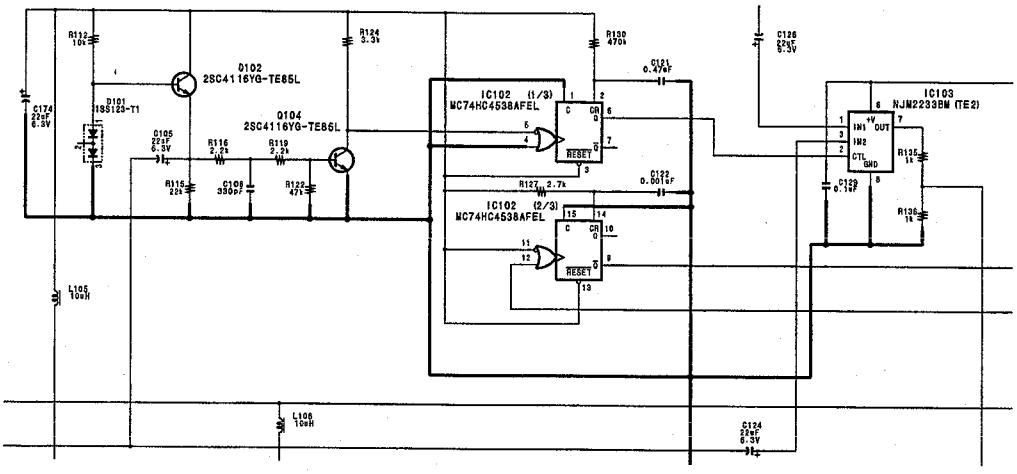


Fig. 1-1 SYNC ON GREEN Discriminator Circuit

(2) Y/C separation block

A digital comb filter (IC109) is used to separate the luminance signal (Y) and chroma signal (C) of a composite video signal.

The input composite video signal is passed through a band rejection filter (FL101), amplified by about two times, and input to pin 15 of IC109. The separated luminance signal is output from pin 6 and passed through a band rejection filter. After that, the signal is input to the video switch (IC104) that switches the luminance signal of an S video signal. In the same manner as described above, a chroma signal is output from pin 8 and input through a band rejection filter to the same video switch.

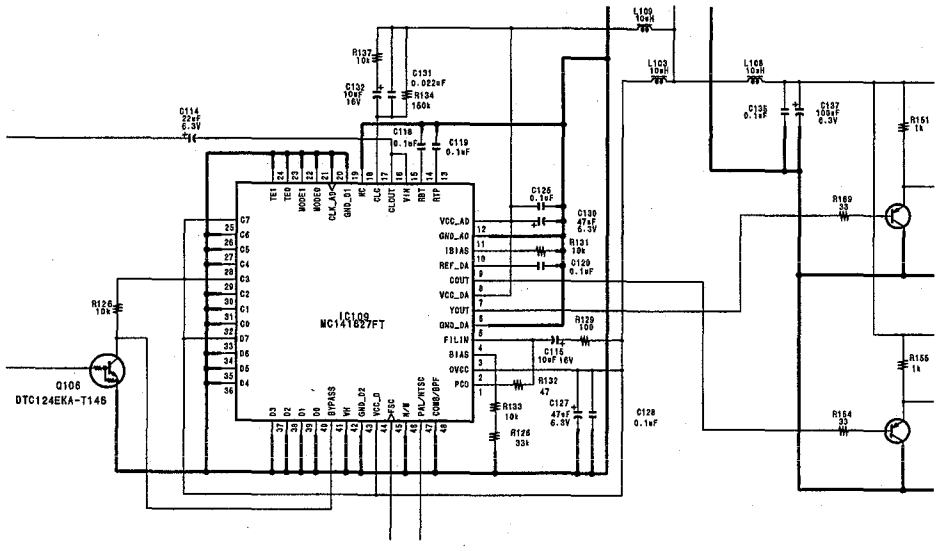


Fig. 1-2 Y/C Separation Block

(3) Composite sync signal separation circuit

A composite sync signal (CSYNC) is separated by IC203.

The composite sync signal of the Y signal input to pin 6 of IC203 is separated by IC203, and the Y signal is output from pin 3. The output signal at pin 3 is positive-synchronous. Therefore, the output signal is inverted by Q201 so that it is negative-synchronous.

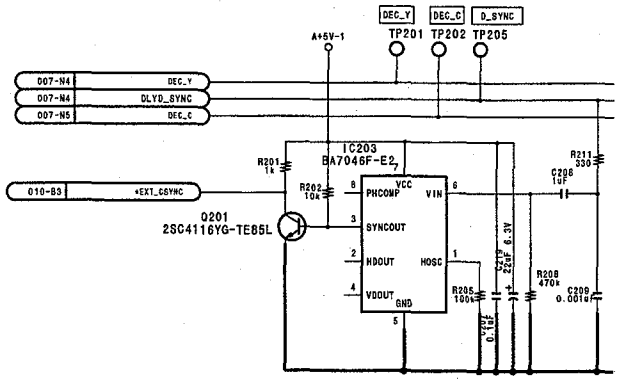


Fig. 1-3 Composite Sync Signal Separation Circuit

(4) Decoder block

On this board, the Y/C jungle (CXA2076Q IC204) for a color television is used for decoding of a video signal. This circuit is compatible with both NTSC and PAL systems. It integrates luminance signal processing, chroma signal processing, RGB signal processing, and sync signal processing into one chip. Each adjustment and setting are controlled by I²CBUS.

The input luminance and chroma signals are input to pins 55 and 57 of IC204. After each processing has been performed, the input signal is output from pins 22, 24, and 26 as an RGB signal.

A VBS/S video signal is delayed by the processing in IC204. Therefore, the signal passed through a delay line (DL101) of 350 ns is used for sync separation so as to make the timing of a video signal coincide with that of a sync signal. (Input signal at pin 56)

The hue and color that the user adjusts are adjusted by IC204.

IC211 is a 1H CCD delay line for PAL.

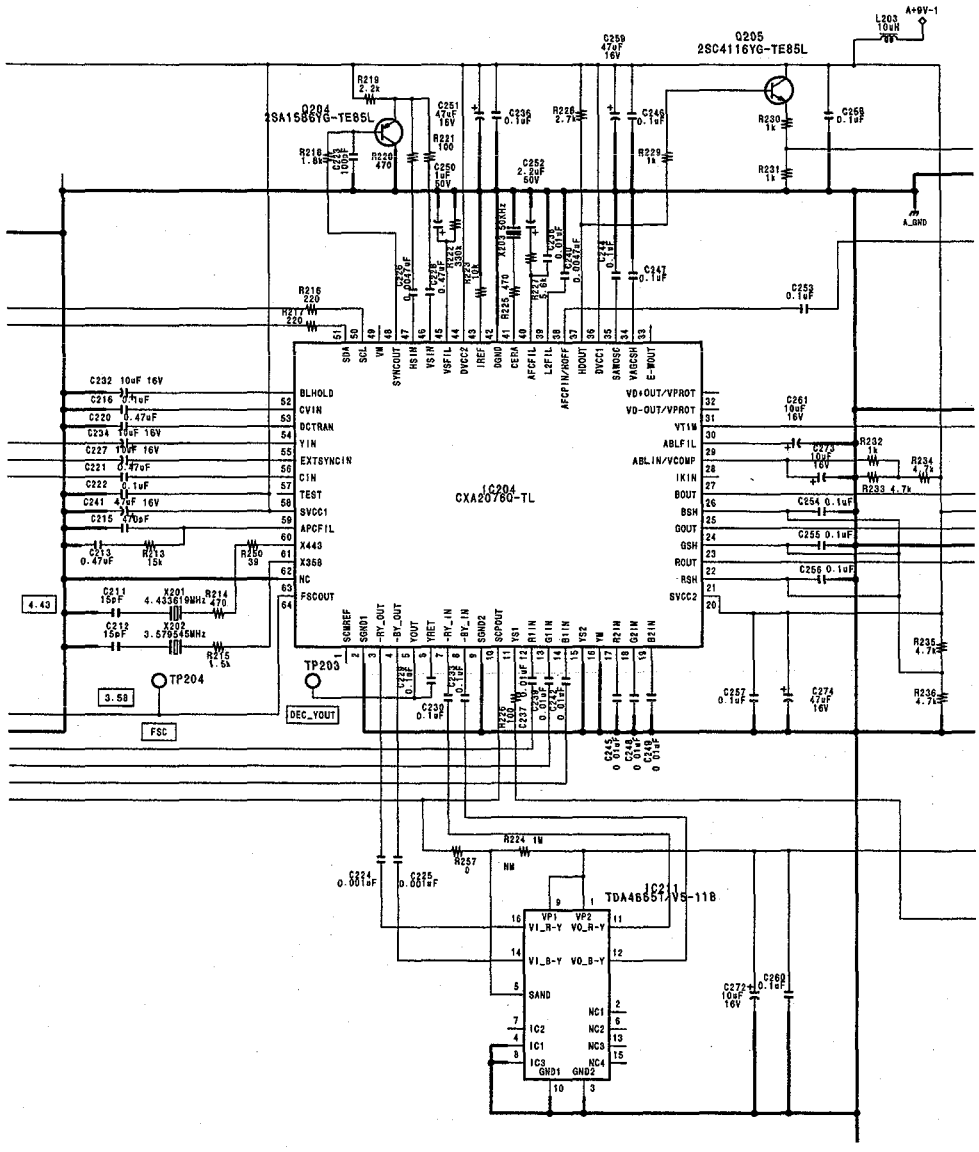


Fig. 1-4 Decoder Block

(5) HD generation circuit

The HD signal output from pin 37 of IC204 is adjusted to the proper phase and pulse width by IC207 (monostable multivibrator) and sent to the frame memory block as an HD (horizontal sync) signal for fetching memory. AFC (Automatic Frequency Control) processing is performed for this HD signal.

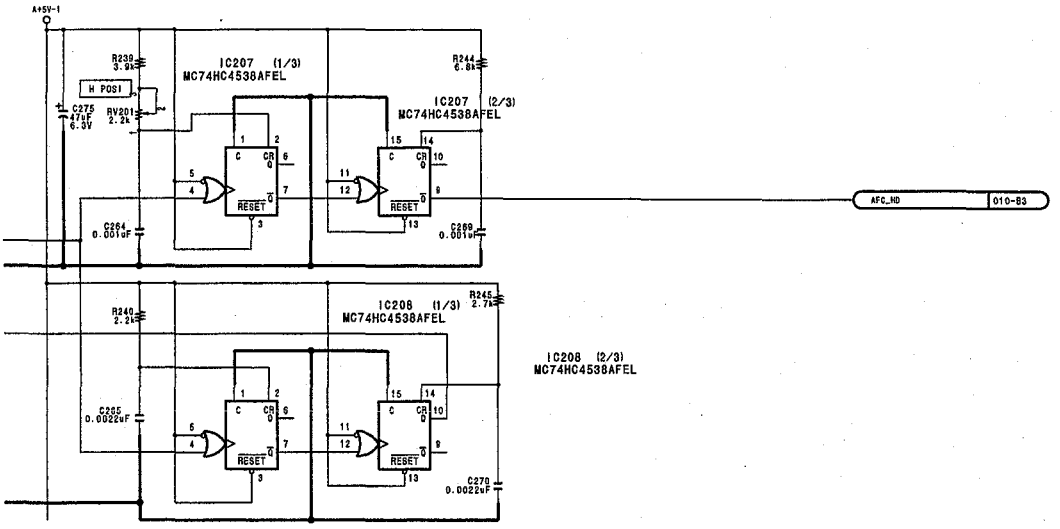


Fig. 1-5 HD Generation Circuit

(6) Demodulation axis correction circuit

Since, in a television circuit (IC204) for the consumer, the demodulation axis is not orthogonal for NTSC, a matrix circuit (R241 to R249) is inserted into an RGB signal line so as to correct the demodulation axis to an orthogonal axis. For PAL, the demodulation axis is orthogonal.
Demodulation is not related when an RGB signal is selected. In this case, therefore, the matrix circuit must be turned off. The matrix circuit is switched to ON or OFF by IC206 and IC210.

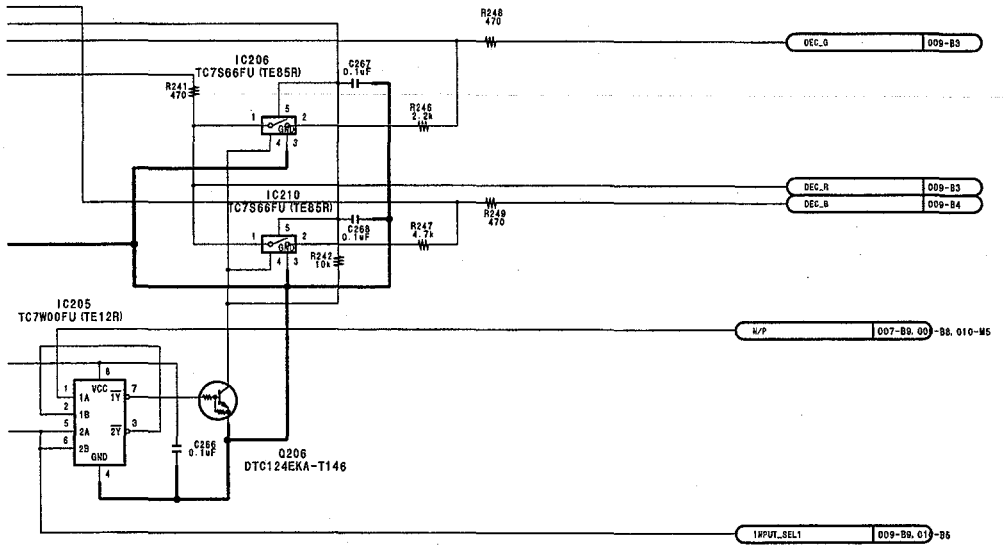


Fig. 1-6 Demodulation Axis Correction Circuit

(7) AGC (Automatic Gain Control) circuit

This unit mounts a peak AGC circuit that has actual results on the medical market.

The peak value of the RGB signal output from IC204 is sampled by Q301, Q302, and Q303. The resultant signal is passed through a low-pass filter (R314 and C306) and then input to the operational amplifier (IC302). The control level is properly adjusted by IC302. The input signal is then passed through a switch (IC307) for manual gain adjustment (output signal at pin 3 of IC303) and input to the control pin of GCA (Gain Control Amplifier) (IC304 to IC306).

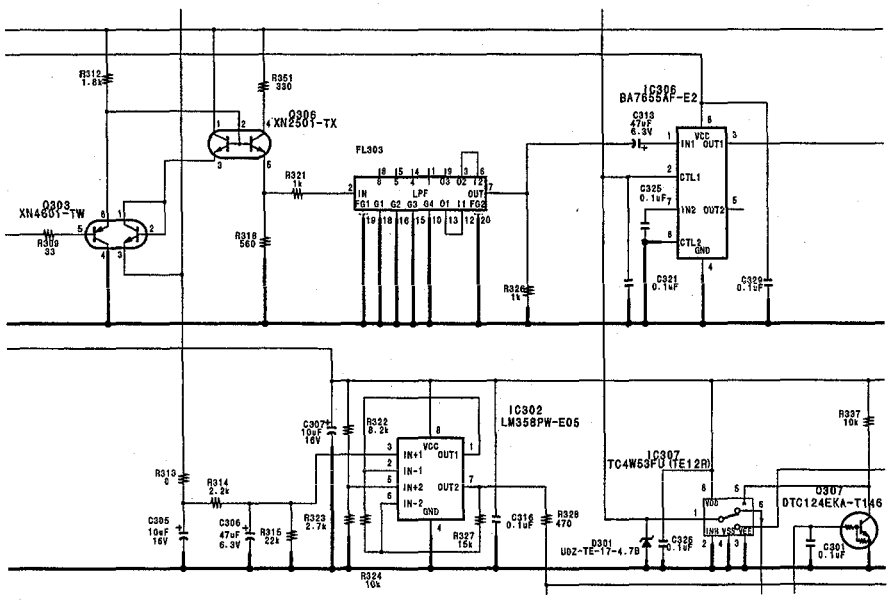


Fig. 1-7 AGC Circuit

(8) EVR (electronic volume) adjustment circuit

Adjustment is partially performed using an electronic volume by IC303.

IC303 has a five-channel internal DA converter. The four channels of it are used for "VBS gain", "offset", "AGC gain", and "manual gain", respectively. Adjustment is performed by I²CBUS.

(9) EEPROM

EEPROM (IC301) is mounted to store the setting and adjustment values of this board. This EEPROM writes or reads data by I²CBUS.

2. Output Signal Processing Block (Encoder Block)

(1) Video encoder block

On this board, BH7243KV (IC407) (made by ROHM) is used as the encoder of a video signal. This circuit incorporates an eight-bit, three-channel DA converter and video encoder. By inputting a subcarrier and composite sync signal, an eight-bit RGB digital signal can be converted into a composite video signal by one chip. The output of RGB, S video, and composite video signals can be driven in 75 ohms. Moreover, this circuit has an internal OSD (On Screen Display) selector switch. Setting and adjustment are all performed by I²CBUS. An OSD character signal is sent from the SY-299 board.

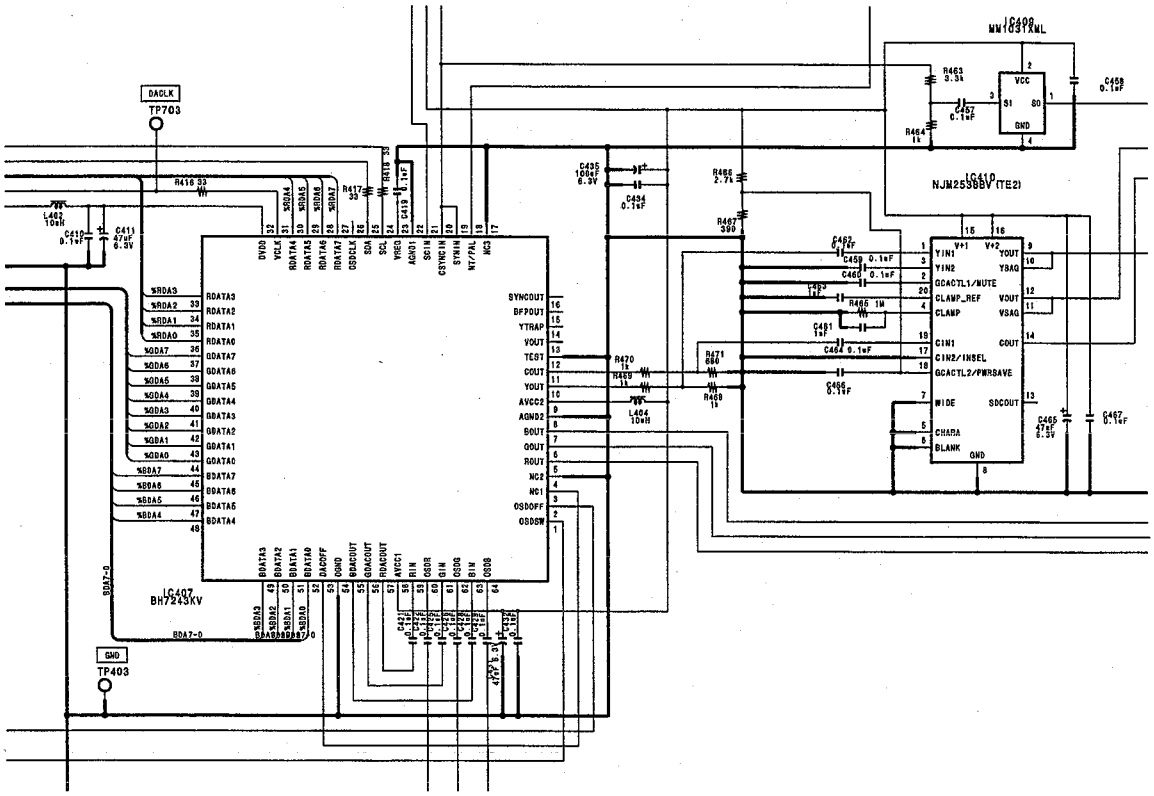


Fig. 1-8 Video Encoder Circuit

(2) Sync generator block

A sync signal for the monitor output must be generated by this unit when a memory image is selected for the monitor output or when no input signal exists. This circuit is peripheral circuit IC406.

IC406 is a sync signal generator compatible with NTSC and PAL systems. IC406 generates video pulses (CSYNC, ODD/EVEN, HD, VD, and SC signals) by inputting a clock. These video pulses are sent to IC407 and a frame memory block.

NTSC and PAL are switched by Q408. For NTSC, the X401 block is turned on, and a clock of 14.31818 MHz is sent. For PAL, the X402 and X403 blocks are turned on, and clocks of 14.1875 MHz and 17.734475 MHz are sent, respectively. For PAL, a subcarrier (SC signal) is synchronized with a horizontal sync signal by VCXO (peripheral circuits Q407 and Q409).

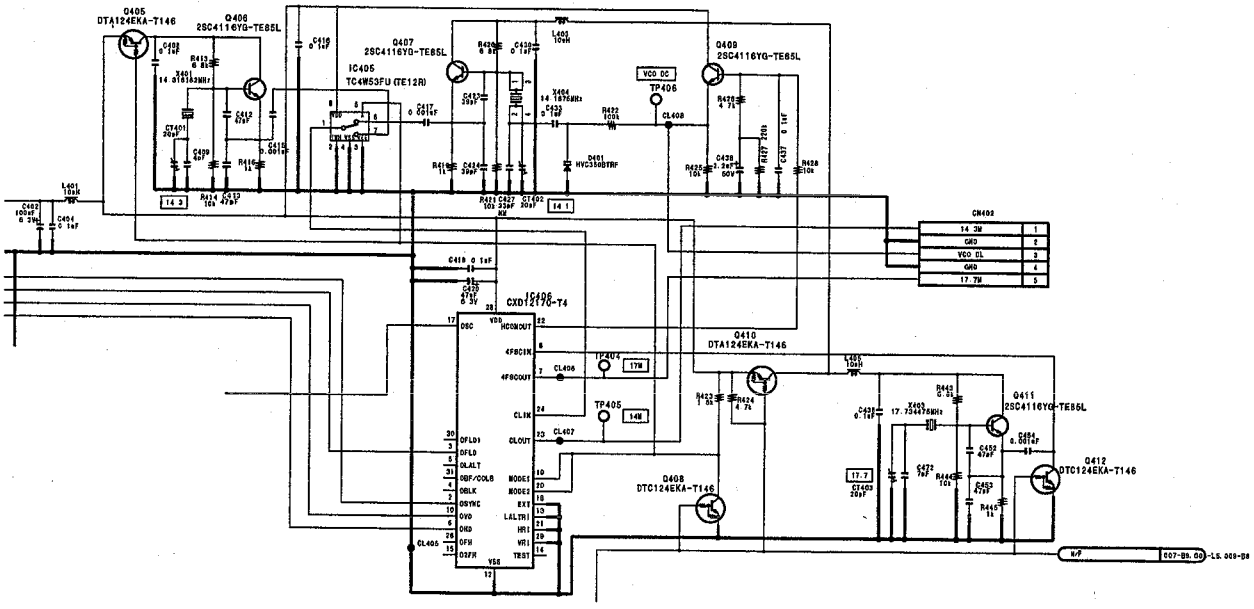


Fig. 1-9 Sync Generator Block

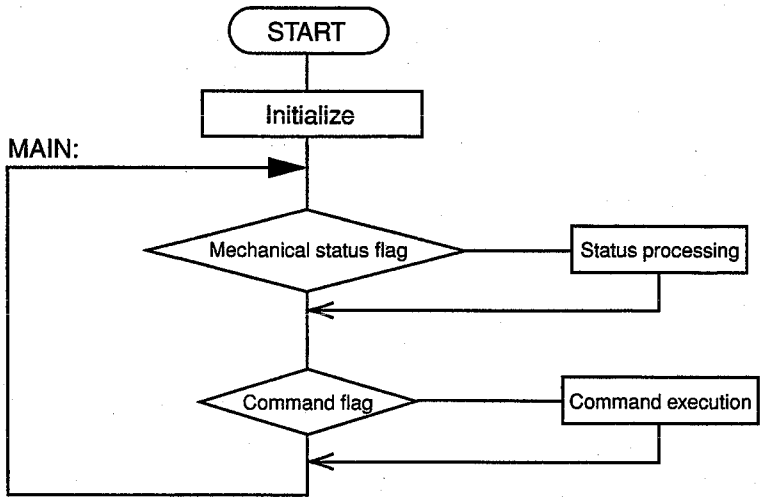
4-3. Operation Description of Print Control Block Circuit

Outline

The print control block consists of the following blocks.

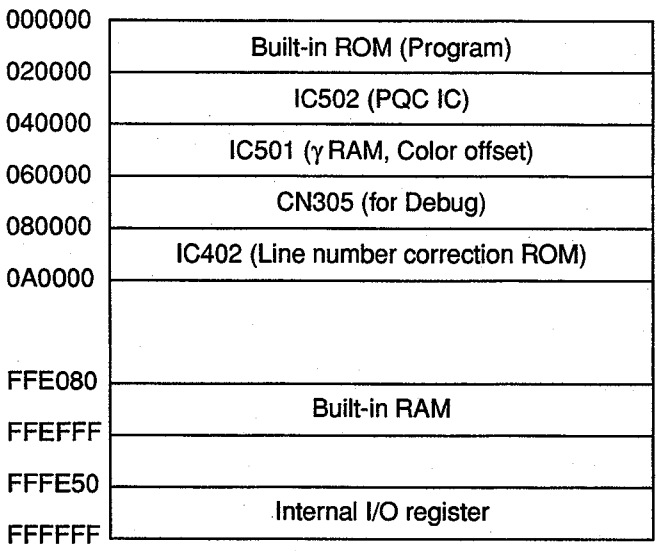
1. Mechanical control block (IC301 and peripheral on the SY-299 board)
2. Head control block (IC401, IC501 and peripheral on the SY-299 board)
3. Motor driver and sensor control block (MEC-15 board)
   IC102 on the MEC-15 board is memorized any informations such as sensor information, total number of the print count on the unit, total number of the print count on the head, record of error message, Shift H, Shift V, remaining amount of ribbon and head voltage parameter.

4-3-1. CPU Flowchart



4-3-2. CPU (IC302) Memory Map

The memory map of CPU is shown below.



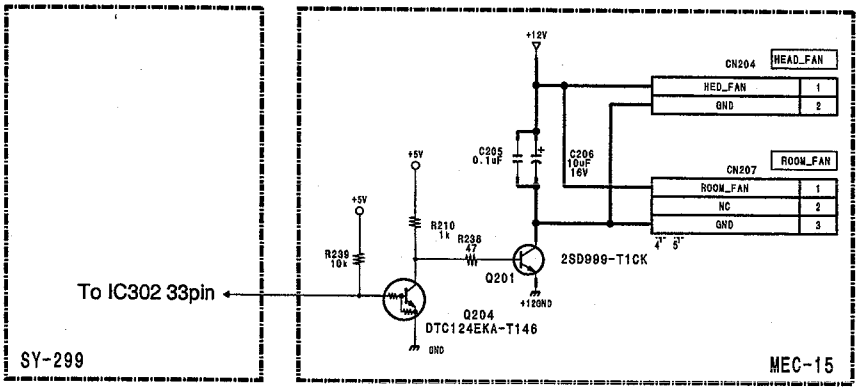
4-3-3. Outline of Motor Drive Function Blocks

The motor drive circuit of a mechanical control block consists of the following circuits.

- Fan motor drive circuit
- Stepping motor drive circuit
- DC motor drive circuit

1. Fan motor drive circuit

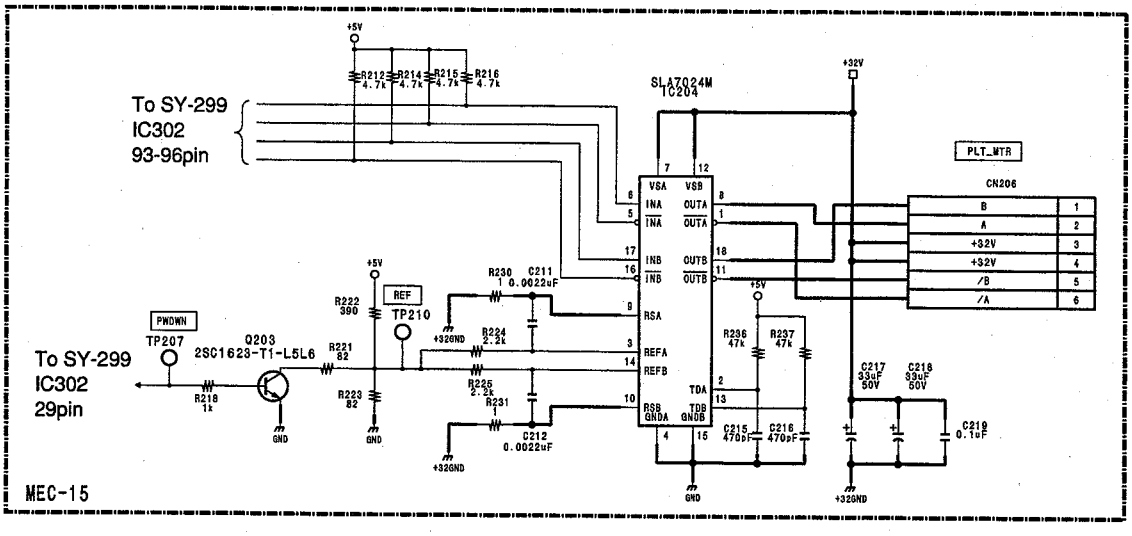
The fan motor is driven by turning on the transistor (Q201) on the MEC-15 board using the control signal from pin 33 of IC302. The fan motor is rotated when the head temperature exceeds the fixed value during printing and in the standby state.



2. Stepping motor drive circuit

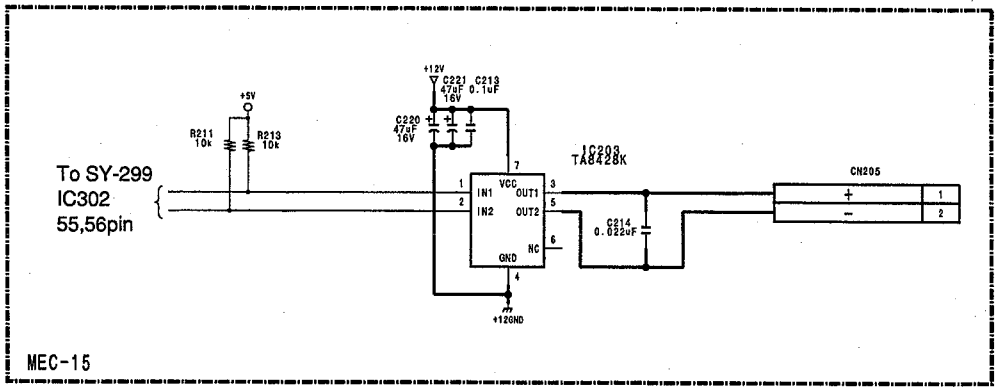
The control signals of each phase (A, $\overline{A}$, B, and $\overline{B}$) are output at pins 93 to 96 of IC302 on the SY-299 board. Drive circuit IC204 on the MEC-15 board drives the stepping motor by chopper drive. The excitation system of the stepping motor is based on one-/two- phase excitation. The reference voltage input to pins 3 and 14 of IC204 on the MEC-15 board drops during a motor stops by switching the control signal at pin 29 of IC302 on the MEC-15 board. Then, grip roller drives through the belt from a stepping motor.

Besides, this circuit is designed that +32 V is not supplied by controlling of power supply control line (pin 3 of CN201) except print and pre-heat conditions.



3. DC motor drive circuit

Motor drive circuit IC203 on the MEC-15 board is controlled by the control signals at pins 55 and 56 of IC302 on the SY-299 board. DC motor drives the feed paper roller, head up/down and ribbon rewinding respectively by each mechanism positions.



4-3-4. Outline of Sensor Detection Circuits

A sensor of this unit is classified into the following three types.
The sensor of the reflective type perform the A/D conversion input according to the change with the passage of time in a sensor level.

Photo interruptive type

- Head position sensor (S8, S9)
- Jamming sensor (S10) (Detects the paper end)
- Delivery flap sensor (S11)

Reflective type

- Paper-in sensor (S1)
- Paper feed sensor (S2) (Detects the paper extremity)
- Ribbon type detection sensor (S5-S7)
- Ribbon cueing detection sensor (S3)

Mechanical type

- Front panel opening detection sensor (SE-642 board)
- Interlock sensor

1. Head position sensor (S8, S9)

Type: Photo Interruptive type
Function: Discriminates the thermal head position.
Level: Discriminates to sequentially shown as below.

Position		HED_POS_SENSE0 IC302 51P	HED_POS_SENS1 IC302 52P
Head up	Standby state	H	H
Paper pip	Paper feed position	H	L
Head half	Ribbon cueing, Paper feed	H	L
Head down	Y print	H	L
Head half	Ribbon cueing, Paper retracting	H	L
Head down	M print	H	L
Head half	Ribbon cueing, Paper feed	H	L
Head down	C print	H	L

2. Jamming sensor (Detects the paper end) (S10)

Type: Photo Interruptive type
Function: Detects whether print paper is not jammed in the mechanical unit during standby.
Detects paper feed and paper during retracting.
Level: PAPER_JAM_SENS IC302 50P
H: Print paper exists.
L: Print paper does not exist.

3. Delivery flap sensor (S11)

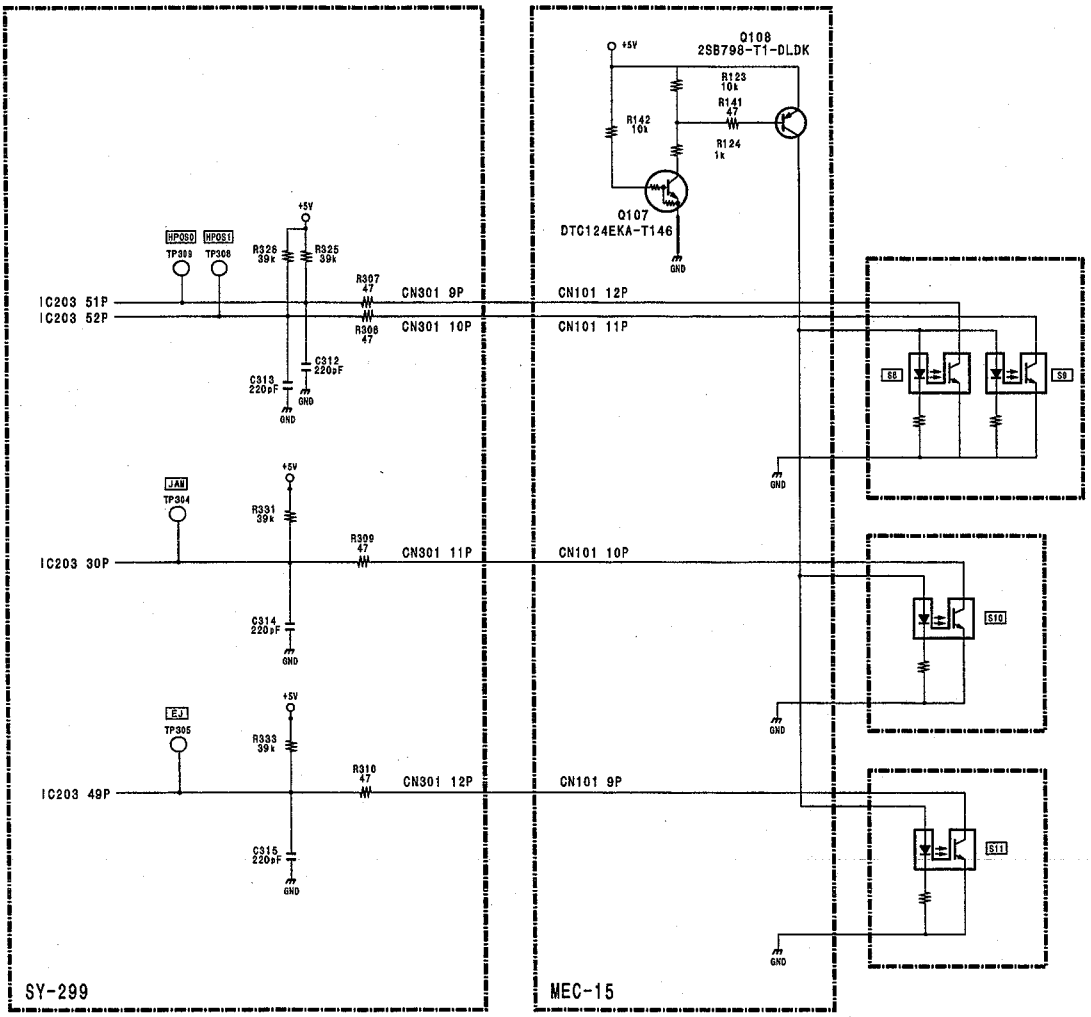
Type: Photo Interruptive type

Function: Detects the paper stack of a delivery part.

Level: PAPER_EJ_SENS IC302 49P

H: Print paper stacks, "REMOVE PAPER" is displayed.

L: Print paper does not exist.



Sensor circuits for S8 to S11

4. Paper-in sensor (S1)

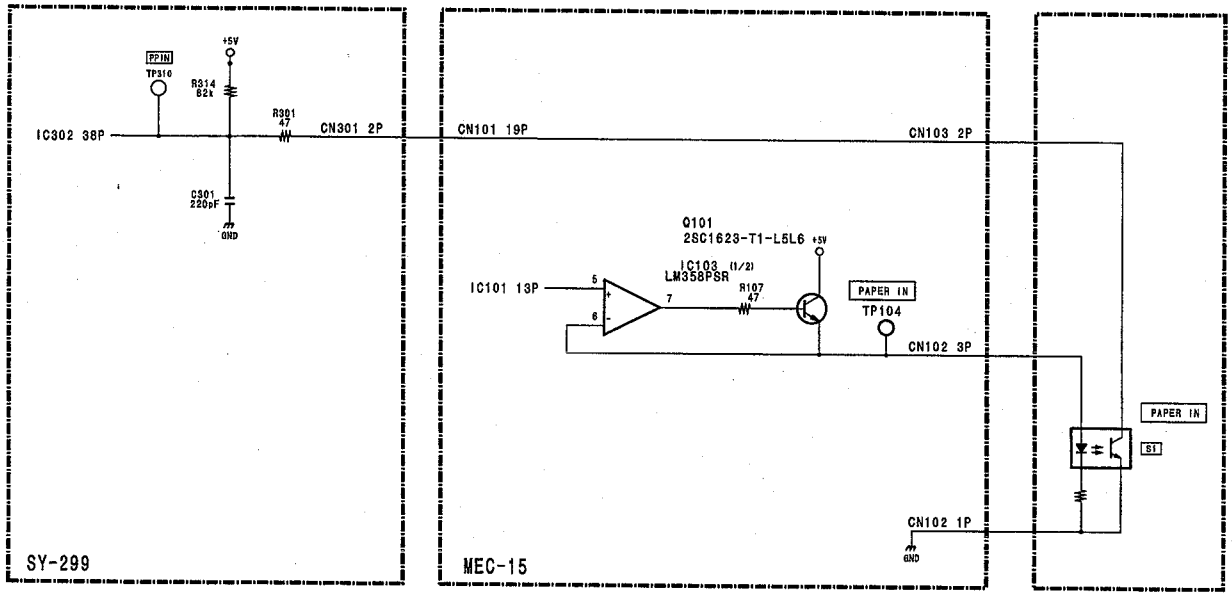
Type: Reflective (Paper reflective) type

Function: Detects whether print paper exist or not into the paper feed tray.

Level: PAPER_IN_SENS IC302 38P

H (analog level): Print paper exists.

L (analog level): Print paper does not exist.



5. Paper feed sensor (Detects the paper extremity) (S2)

Type: Reflective (Paper reflective) type

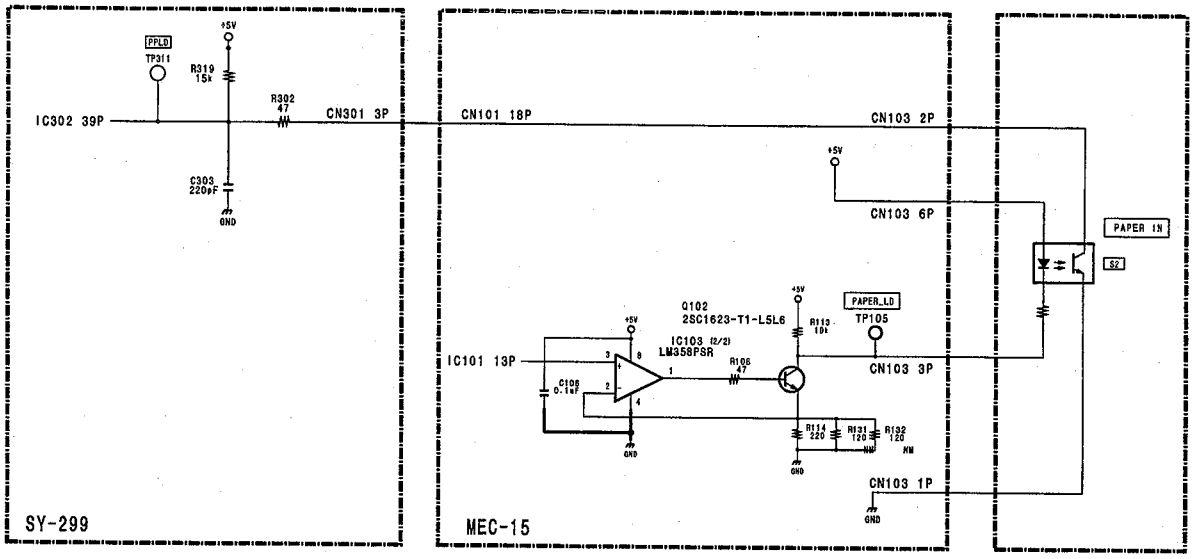
Function: Detects the paper feed timing.

Detect whether print paper is not jammed at a paper feed port during standby.

Level: PAPER_LD_SENS IC302 39P

H (analog level): Print paper exists.

L (analog level): Print paper does not exist.



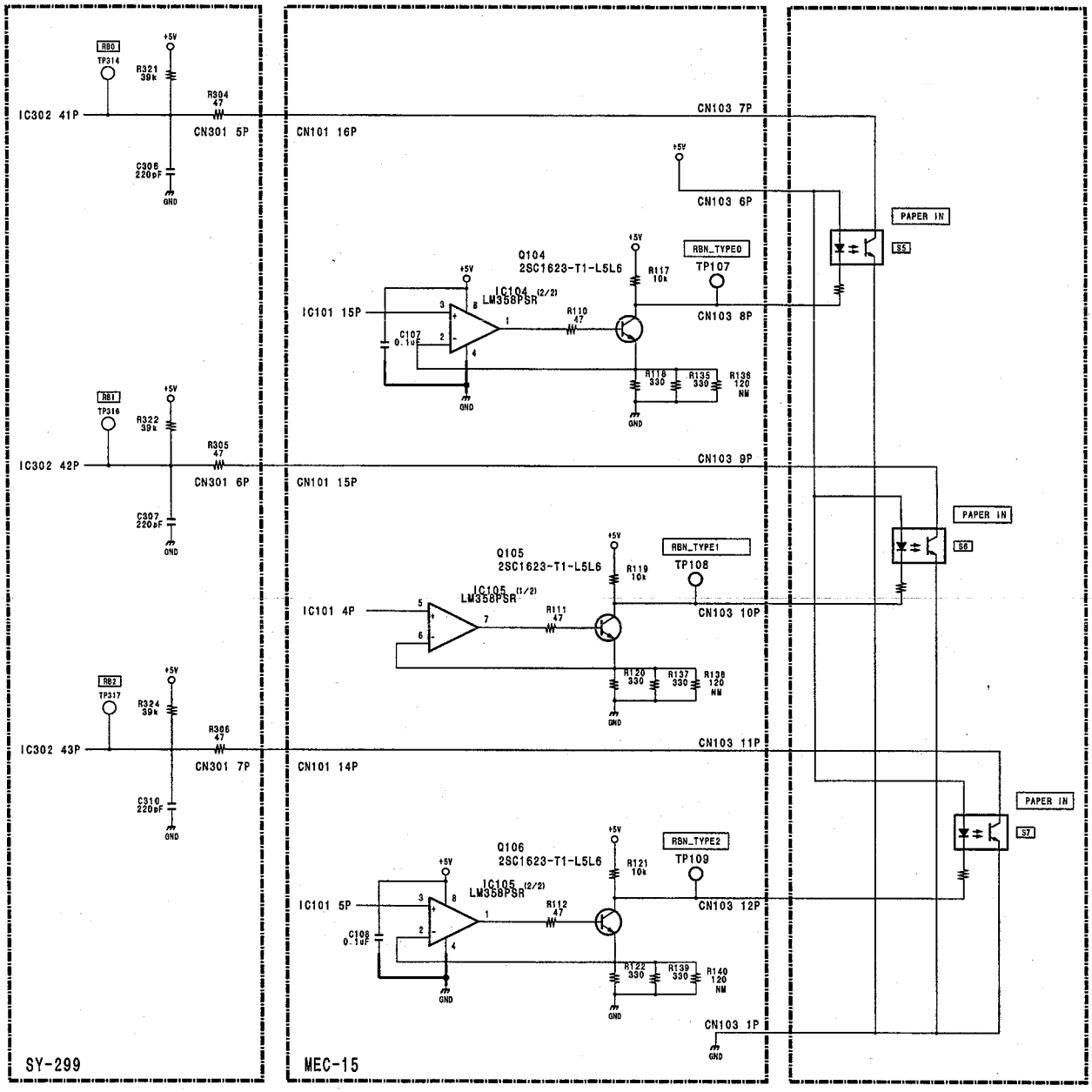
6. Ribbon type detection sensor (S5-S7)

Type: Reflective type

Function: Detects whether ribbon cassette is installed on the unit.
Discriminates the type of ribbon cassette.

Level: (analog level)

	RBN_TYPE_SENS0 IC302 41P	RBN_TYPE_SENS1 IC302 42P	RBN_TYPE_SENS2 IC302 43P
UPC-21S	H	L	H
UPC-21L	L	H	L
Cleaning	L	L	L



7. Ribbon cueing detection sensor

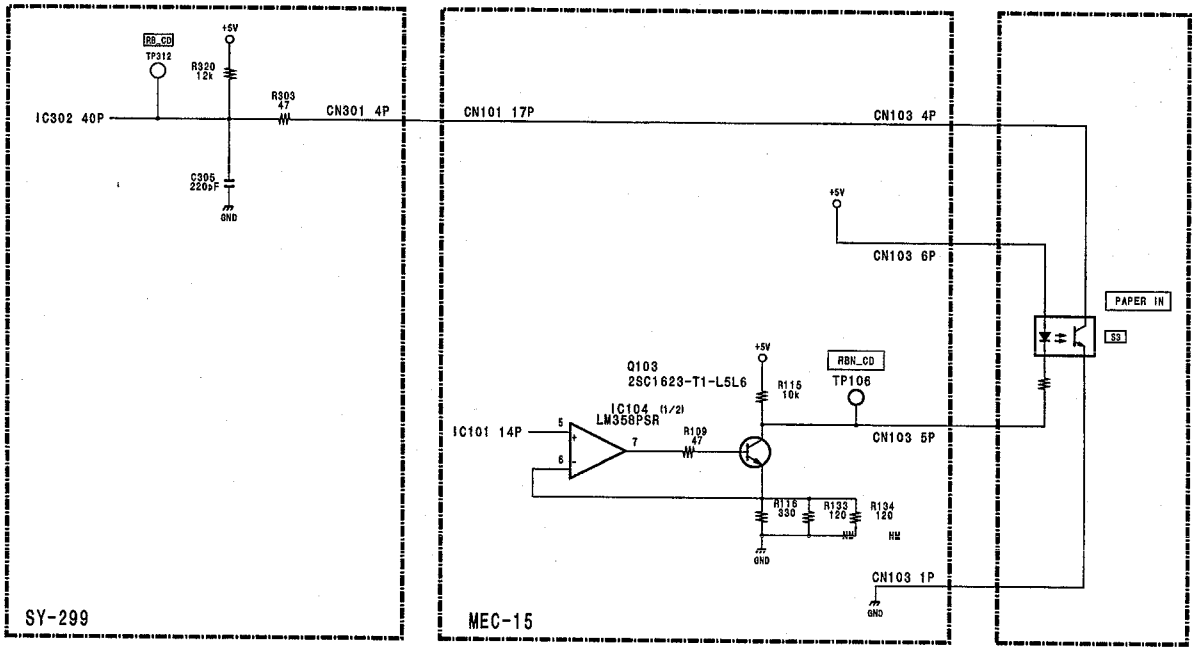
Type: Reflective type

Function: Detects the start mark and cue mark of a ribbon.

Level: RBN_CD_SENS IC302 40P

H (analog level): Detects the cue mark of each color.

L (analog level): Others



8. Front panel opening detection sensor (SE-642: S401)

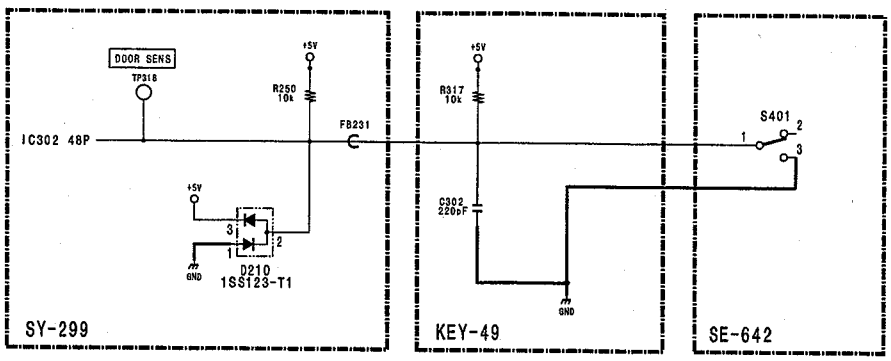
Type: Mechanical type

Function: Detects whether opening or closing of the front panel.

Level: DOOR_SENS IC302 48P

H: Open the front panel.

L: Close the front panel.



9. Interlock sensor

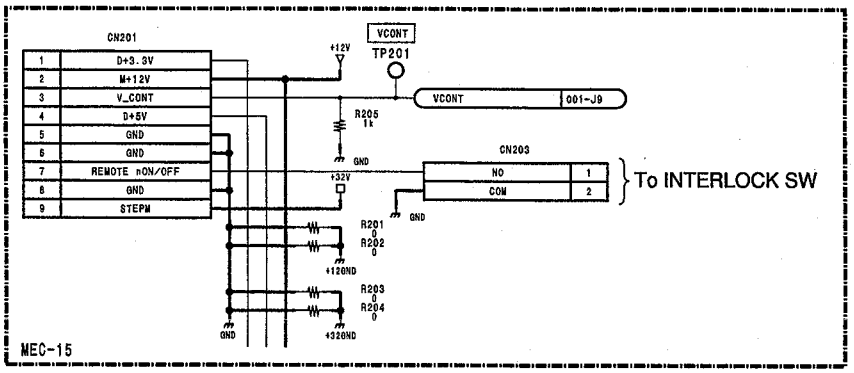
Type: Mechanical type

Function: Detects whether bottom plate is installed on the unit. When bottom plate is not installed on the unit, turn off the power of the unit.

Level: MEC-15 board CN201 7P

H: Power ON

L: Power OFF



4-3-5. Head Control Block

The head control block corrects the parallel print data per line from the VPR-74 board and transfers it to the thermal head for printing.

The head control block consists of the following five blocks.

- Color table γ RAM plus temperature correction offset (IC501) that γ-corrects the parallel print data from VPR-74 board
- Image processing circuit (picture quality control) (IC502) that performs pattern recognition interpolation, edge emphasis, and thermal storage correction
- Head drive circuit (IC401, 403) that PWM-converts parallel data and transfers print data to the thermal head
- Line number correction circuit (voltage drop control) (IC402) that corrects the voltage drop due to the common resistor of a thermal head
- Head voltage correction circuit

Print data is received from the VPR-74 board as parallel data, γ-corrected, and processed by a PQC circuit. After that, the print data is PWM-modulated using a head drive circuit and transferred to the thermal head via CN401 on the SY-299 board.

γ correction circuit

The print data sent from the VPR-74 board is γ-corrected using the data conversion table of γ RAM (IC501). Before printing, the γ data of each YMC color corresponding to the media type, paper feeding and γ type is written in the address of γ RAM. IC501 also accounts two data offset for temperature correction of continuity printing and color balance functions, and then add it to print data.

PQC IC

The main functions of PQC IC are as follows.

- Edge emphasis
  Performs the edge emphasis that improves the sharpness of an image using a digital filter in the horizontal and vertical directions.
- Thermal storage correction
  Corrects the dullness and unstableness of rising due to the defective thermal response of a head using a digital filter.
- Re-sizing
  Digitized video signal data is re-sized to number of a head element corresponding to division mode.
- Patter recognition of data complement
  Performs the data complement in relation to the head direction and feed direction respectively.

Head drive circuit

- PWM modulation
  PWM-modulates eight-bit parallel data and converts it into serial print data.
- Divided print processing
  Divides one gradation into four for printing so that the clearance between print lines does not stand out when the print dot area of a low-density image portion becomes smaller.

Line number correction circuit

The combined resistance of an element decreases when the number of heating resistor elements that carries a current to the thermal head increases. In this case, the voltage drop due to the common resistance of a harness cannot be ignored and the print density decreases. Therefore, this circuit controls the current-carrying time of a head element and corrects the print density.

Head voltage correction

The head voltage can be increased or decreased by changing a VCONT signal (pin 3 of CN201 on the MEC-15 board) for the power supply block. A VCONT signal is controlled using software by using the D/A conversion output (pin 6 of IC101 on the MEC-15 board).
All that, head voltage is not output according to VCONT signal controls except during printing and pre-heating of the thermal head.

- Correction by feed pitch
  When data is printed at the same head voltage, the print density becomes thicker as the feed pitch becomes narrower. Therefore, an offset is made in each feed of ordinary S-size print (FULL, two-division and four-division), L-size print (FULL, two-division and eight-division) and moreover printing speed.

4-4. Circuit Operation Description of System Control Block

System control block consists of the following circuit blocks.
- IC103 and peripheral circuit on the SY-299 board
- KEY-49 board
- IF-851 board
- IF-852 board

This section describes the following contents.
1. Special mode and special operating method
2. Address map
3. Circuit operation
4. Communication with internal CPU
   - Interface with mechanical control block (IC302: PRT) on the SY-299 board
   - Interface with mechanical control block (IC501: FMY) on the VPR-74 board
5. Analog video block (VA) control of the VPR-74 board
   - I^2C bus control
   - Screen display-related signals
   - Status signal
6. RS communication control
7. Media protection such for software

4-4-1. Special Mode and Special Operating Method

- Reset of the default setting
  Turn on the power by pressing the [STOP], [CAPTURE] and [PRINT] keys simultaneously.
- Service mode
  Turn on the power by pressing the [←] and [→] keys simultaneously.
- Mechanical adjustment mode
  Turn on the power by pressing the [DISPLAY] and [EXEC] keys simultaneously.
- Transport mode
  Press the [←], [→] and [MENU] keys simultaneously during power on condition.

4-4-2. Address Map

Address	Contents	IC	Remarks
000000h-03FFFFh	256k-byte FLASH	IC103	CPU built-in
400000h-400003h	LCD	IC201, IC204	
600000h-600008h	Keymatrix	IC201, IC204	
FFB000h-FFEFBFh	16k-byte SRAM (1/2)	IC103	CPU built-in
FFF800h-FFFFBFh	I/O	IC103	CPU built-in
FFFFC0h-FFFFFFh	16k-byte SRAM (2/2)	IC103	CPU built-in

4-4-3. Circuit Operation

• Reset circuit

The reset circuit uses PST572CMT (IC105). This circuit outputs a low pulse of about 60 msec when Vcc becomes less than 4.5 V during the power-on or off sequence. The reset pulse is input to the reset pin (pin 59) of CPU (IC103). The CPU on the SY-299 board is then reset. After the reset is released, the CPU outputs the reset pulses for other boards from the reset output pins (pins 28 and 74).

IC103	TP	Object to be reset	Remarks
Pin 59	TP110:RESET1	CPU on SY-299 board	Output of reset circuit
Pin 28	TP109:RESET2	VPR-74 board and peripheral circuit on SY-299 board	
Pin 74	TP106:RESET3	Mechanical control block	

• Oscillator circuit

The basic clock (9.8304 MHz) of the SY-299 board that is generated using an oscillator circuit incorporating a crystal oscillator (X101) and CPU (IC103) can be confirmed at pin 61 of IC103.

• Nonvolatile memory

Each menu setting, caption character string or data for "COLOR LOAD" and "USER LOAD" is stored in 64 kbit I^2C serial EEPROM (IC101). The system starts under last-call state (that is setting state under turned off the power) according to data is read from the nonvolatile memory when the system starts. However, when setting is changed in COLOR ADJUST menu and turn off the power during [TEMP] state but "SAVE COLOR" is not set in the menu, setting value on this menu page is not stored in IC101. At that, I^2C bus using for data storing is used in common that controls for analog board. When this IC is replaced, reset of default setting must be performed after resetting of "LANGUAGE" on the SERVICE MENU 1.

• LED control

The PRINT LED (that lights during printing) is controlled by CPU (pin 35 of IC103). A digital transistor of final stage is Q301 on the KEY-49 board. The ALARM LED (that lights when an error occurs in a printer) is controlled by CPU (pin 36 of IC103). A digital transistor of final stage is Q302 on the KEY-49 board.

• Buzzer control

A buzzer sound pulse is output from CPU (pin 39 of IC103). The buzzer does not sound when [BEEP:OFF] is set in the menu.

• Liquid-crystal display (LCD) control

The bus control of LCD is performed using IC201 and IC204, and IC301 on the KEY-49 board. The display density of LCD is decided the analog voltage value that is output from CPU (pin 43 of IC103) and then drive it in IC 206 and peripheral circuit. No display may appear on the LCD when [LCD-CONT:OFF] is set in the menu. This circuit is common to keymatrix and operates as bus control of LCD when CS2 is set in the menu.

• Input of main unit's key (main key/operation key)

The state of the main unit's key is processed by IC201 and IC204, and IC303, IC304, D305 to D308 and R342 to R347 on the KEY-49 board, and input through a data bus to CPU. This circuit is common to bus control of LCD and operates as input of main unit's key when CS3 is set in the menu.

• Screen display control

A screen display control signal is generated by IC102. Exclusive clock circuit uses in this IC102. The clock frequency have an effect to horizontal size on the screen. The H-sync and V-sync signal inputs from the VPR-74 board are required as a timing pulse during operation. The control signal of display data is output from CPU (pins 1 to 3 of IC103). Characters are actually superimposed using an analog switch on the VPR-74 board. No screen display may appear when [SOURCE:THRU] or [DISPLAY:OFF] is set in the menu.

• Remote 1 input and infrared remote control reception

An infrared remote control pulse is received using the infrared photosensor (IC302) on the KEY-49 board. This pulse is waveform-shaped by IC209 on the SY-299 board and output to the IF-852 board. When a wired remote control is connected to J1 on the IF-852 board, a wired remote control pulse is selected as output. When it is not connected to J1, output pulse of a photosensor is selected as output. One of selected pulse is waveform-shaped by IC209 on the SY-299 board and shift by IC106, then input to CPU (pins 40 and 41 of IC103). Therefore, the wire remote control operation may fail due to the failure of J1 on the IF-852 board.

• Remote 2 input

The two types of remote controls can be connected that are a open/short remote control (RM-91 etc.) and analog-level remote control (FS-36 etc.) in J2 on the IF-852 board. A open/short-level signal is processed by IC205 and input to CPU (pin 75 of IC103). An analog-level signal is processed by IC206 and input to CPU (pin 49 of IC103).

• Remote 2 output

The control signal of a BUSY output signal is output by CPU (pin 34 of IC103) and driven using a buffer (IC208). Afterward, a signal is input to two circuits of TTL output and open collector output, then an output signal is decided either them by setting of S201 on the SY-299 board.

4-4-4. Communication with Internal CPU in Unit

• Interface with mechanical control block on the SY-299 board (IC302: PRT)

Bi-directional communication is performed by the asynchronous serial communication that uses serial communication interface CH.0 incorporated into CPU.

Signal line name	I/O	Description	
SY_PRT_TXD	Output	Communication data (IC103: SY → IC302: PRT)	
PRT_SY_RXD	Input	Communication data (IC302: PRT → IC103: SY)	
SY_PRT_RTS	Output	Communication enable (IC103: SY → IC302: PRT)	L:active
PRT_SY_CTS	Input	Communication enable (IC302: PRT → IC103: SY)	L:active

Communication format	
System	Asynchronous system
Data length	8 bits
Stop bit	1 bit
Parity	None
Baud rate	19200 bps

• Interface with mechanical control block on the VPR-74 board (FMY)

Bi-directional communication is performed by the asynchronous serial communication that uses serial communication interface CH.3 incorporated into CPU.

Signal line name	I/O	Description	
SY_FMY_TXD	Output	Communication data (SY-299 board, IC103: SY → VPR-74 board, IC501: FMY)	
FMY_SY_RXD	Input	Communication data (VPR-74 board, IC501: FMY → SY-299 board, IC103: SY)	
SY_FMY_RTS	Output	Communication enable (SY-299 board, IC103: SY → VPR-74 board, IC501: FMY)	L:active
FMY_SY_CTS	Input	Communication enable (VPR-74 board, IC501: FMY → SY-299 board, IC103: SY)	L:active

Communication format	
System	Asynchronous system
Data length	8 bits
Stop bit	1 bit
Parity	None
Baud rate	19200 bps

4-4-5. Analog Video Block (VA) Control on the VPR-74 Board

• I²C bus control

Purpose

Controls the I²C bus circuit on the analog board.

Signal line name	I/O	Description	
IIC-SCL	Output	Serial data clock	H:active
IIC_SDA	Output	Serial data	H:active
IIC_CTS	Input	Serial data transfer enable	H:active

Functions obtained by I²C bus control

(User menu)

HUE, COLOR, GAIN, OFFSET, MONI-R, MONI-G, MONI-B, IRE, SYNC ON G, and INPUT SEL

(Service menu)

PICTURE, G DRIVE, B DRIVE, SUB-BRIGHT, and VBS Y

(Other functions)

HALFTONE

Note

The object to be handled is an I²C-compatible circuit on the VPR-74 board. The center value for adjustment is stored in I²C-EEPROM on the VPR-74 board. During start, the SY-299 board reads data from I²C-EEPROM and initializes the IC on the VPR-74 board. These set values can be changed (readjusted) in the service man mode. No communication is performed when I²C-CTS is in the send disable (L) state.

• Screen display-related signals

Purpose

Produces a pulse signal for screen display.

Signal line name	I/O	Description	
OSD-R	Output	Screen display control data (R)	H:active
OSD-G	Output	Screen display control data (G)	H:active
OSD-B	Output	Screen display control data (B)	H:active
OSD_BLK	Output	Screen display control data (Blanking)	H:active
OSD_ON_NOFF	Output	Batch control of screen display superimposition (yes/no)	H:active
OSD_HD	Input	Timing pulse (H-SYNC)	Sync negative
OSD_VD	Input	Timing pulse (V-SYNC)	Sync negative

• Status signal

Input signal specification

The signal line INPUT_SEL1 shows on the schematic diagrams, but this line does not use in reality. All of input signal switching realizes by IIC controls.

• Signal selection during output of source screen

THRU_EE	Contents
L	THROUGH
H	EE

Note

This signal is used for control of a relay switch on the IF-851 board.

When menu/error appear on the screen, EE screen is output even if SOURCE is set to THRU.

• Color and B/W selection

SET_CL_nBW	Contents
H	COLOR
L	B/W

Note

COLOR/BW bit processed on the I^2C bus circuit is output by a status signal.

• Video mode (NTSC/PAL) selection

SW_NTSC_NPAL	Contents
H	NTSC
L	PAL

Note

This mode is connected to the NTSC/PAL set switch on the IF-852 board.

4-4-6. RS Communication Control

A serial signal of TTL level that is produced is serial communication interface CH.2 incorporated into CPU, is converted at ±8 V by level conversion IC (IC202 and IC203) then output it.
The last output signal is as follows:
Active: 8 V
Non-active: −8 V
The TP position is as follows:
Active: 0 V
Non-active: +5 V

Signal line name	I/O	Description
TXD	Output	Communication data (UP → External)
RXD	Input	Communication data (External → UP)
RTS	Output	Communication enable (UP → External)
CTS	Input	Communication enable (External → UP)
DTR	Output	Operation status (UP → External)
DSR	Input	Operation status (External → UP)

	Communication format
System	Asynchronous system
Data length	8 bits
Stop bit	1 bit
Parity	None
Baud rate	1200/2400/4800/9600 bps (Menu switching)

4-4-7. Media Protection such for Software

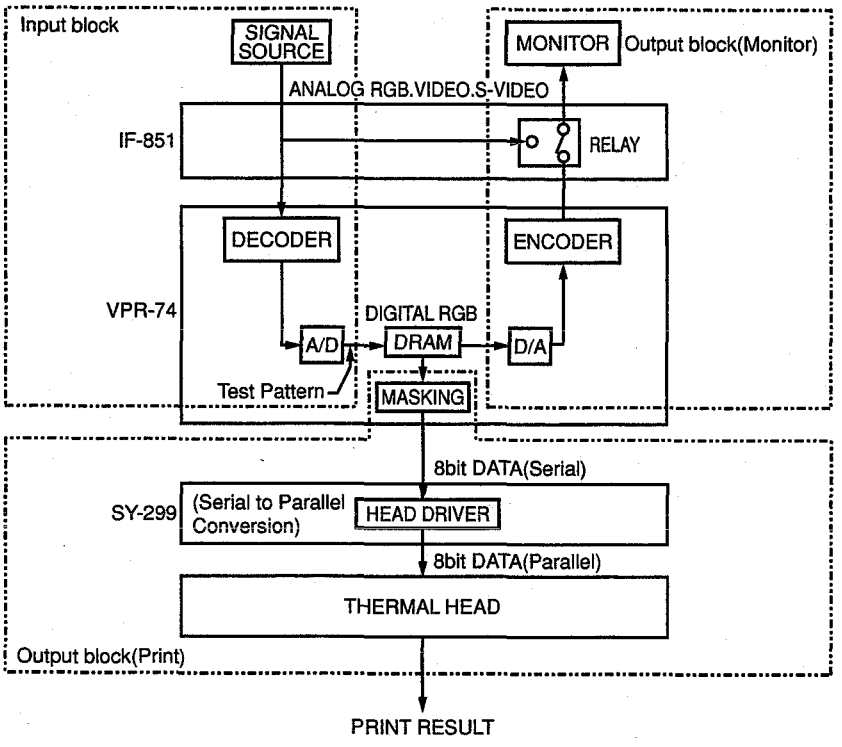
Error message "CHECK RIBBON A0" is displayed when specific printer of exclusive use for S paper is set the L paper.

Section 5
Troubleshooting

5-1. Video (Image) Related Trouble

The flow of a video signal is shown in the figure below.

[Flow of video signal]



The flow of a video signal can be mainly classified into input, monitor output, and print output blocks. The block in which a trouble occurs can be supposed from the trouble state.

1. Both the print result and monitor display are abnormal.
   In this trouble state, a trouble occurs in the input block.
2. The print result is normal and the monitor display is abnormal.
   In this trouble state, a trouble occurs in the monitor output block.
3. The print result is abnormal and the monitor display is normal.
   In this trouble state, a trouble occurs in the print output block.

Each block is described below.
For more details, refer to the block diagram, schematic diagram, and circuit operation description of each board.

Input Block

In the input block, the flow of a signal is as follows:
Signal input terminal (IF-851) - ADC (VPR-74) - DRAM (VPR-74)
If a trouble is judged to occur in the input block, check the state of a video trouble fully. For fine symptoms in dots, a trouble may occur in a digital processing system [ADC (around IC350 to IC352) - DRAM (around IC801)]. In other states, a trouble may occur in an analog processing system [IF-851 - Decoder (around IC204) - ADC].
In the trouble of an analog processing system, the place where a trouble occurs can be more narrowed down by checking the state of each signal (VIDEO, S-VIDEO, and RGB).

Monitor Output Block

In the monitor output block, the flow of a signal is as follows:
DRAM (VPR-74) - Encoder (VPR-74) - Signal output terminal (IF-851)
Like an input processing block, it can be supposed to some degree by the trouble state whether the block where a trouble occurs is a digital processing system [DRAM - encoder (around IC407)] or analog processing system (encoder - IF-851).
The place where a trouble occurs can be more narrowed down by the state of each monitor output signal (VIDEO, S-VIDEO, and RGB).

Print Output Block

In the print output block, the flow of a signal is as follows:
DRAM (VPR-74) - Masking (VPR-74) - Head control (SY-299) - Thermal head
The data output from DRAM on the VPR-74 board is input through the masking circuit (around IC902 and IC903) on the VPR-74 board to the head control circuit (around IC401, IC402, and IC403) on the SY-299 board.
Moreover, the print signal that was converted from serial to parallel in the head control block is output through a harness from CN401 on the SY-299 board to the thermal head.

5-2. Mechanical Troubleshooting

Symptom	Cause	Remedy
Power does not turn on	Interlock switch is damaged	Replace an interlock switch
	Interlock switch connector is not connected	Connect an interlock switch connector
Ribbon cassette is not inserted	Head block incorrectly position	Turn on the power again
	Head block incorrectly position (Sensor S8 or S9 has failed)	Replace the sensor board assembly of S8 or S9
	Head block incorrectly position (Gear or cam is damaged)	Replace a gear or cam
	Head block is slipped out of the place	Reinstall a head block
	Ribbon guide is detached	Reinstall a ribbon guide
Head does not move to downwar	Head block is unbiased when installing	Reinstall a head block while biasing
Cannot set the paper tray	Pinch roller shaft is detached	Reinstall a pick roller shaft
SET PAPER indicator does not disappear even if setting the paper	Sensor S1 has failed	Replace a S1 sensor board assembly
	Harness on S1 sensor board assembly is not connected	Connect a harness
	Paper curled	Remove the paper curling
NO RIBBON CASSETTE indicator does not disappear even if setting the ribbon	Sensor S5, S6 or S7 has failed	Replace a S2 sensor board assembly
	Harness on S2 sensor board assembly is not connected	Connect a harness
	Specified ribbon cassette does not use	Use a specified ribbon cassette
	Discrimination mark for ribbon cassette is stripped	Replace a ribbon cassette
Cannot paper feed (Cannot pull in paper to the unit)	DC motor has failed (No rotating)	Replace a DC motor
	DC motor connector is not connected (No rotating)	Connect a DC motor connector
	Pick roller slipped	Confirm the paper surface not dirty
		Replace a pick roller assembly (Worn out of roller)
	Planetary gears 1, 2 and 3 cannot change correctly	Replace the mechanism deck
	Harness make contact to pick roller	Improve the wiring of harness
	Gear has failed (or damaged)	Replace a gear
Cannot paper feed (Paper can pull in to the unit but stops into grip roller)	STM has failed (No rotating)	Replace a STM assembly
	STM connector is not connected	Connect the connector on a STM assembly
	Grip roller does not meshing to pinch roller	Replace the mechanism deck
	Loss of synchronism in STM (Belt incorrectly tension)	Readjust the belt tension correctly
	Gear has failed (or damaged)	Replace a gear

Symptom	Cause	Remedy
Unsuitable size of paper and ribbon cassette is displayed	Paper is unsuitability size with ribbon	Replace the paper or ribbon cassette in order to suitability size
	Ribbon discriminate mark cannot discriminate by dirty etc.	Replace a ribbon cassette
	Sensor S5, S6 or S7 has failed	Replace a S2 sensor board assembly
	Harness on S2 sensor board assembly is not connected	Connect a harness
	Overlapped paper feed (Extreme cannot detect on the paper)	Remove the overlapped feed paper (Do not use the removed paper) Replace the mechanism deck
	Overlapped paper feed cause of the paper stuck	Remove the overlapped feed paper (Do not use the removed paper) Dispose the remained paper thoroughly
	Grip roller does not meshing to pinch roller	Replace the mechanism deck
	Actuator type photo sensor has failed	Replace an actuator type photo sensor
	Connector of an actuator type sensor is not connected	Connect a connector of an actuator type photo sensor
	Loss of synchronism in STM (Belt incorrectly tension)	Readjust the belt tension correctly
	Gear has failed (or damaged)	Replace a gear
Cannot printing	Power supply cable of a head is not connected	Connect a power supply cable of a head
	Head harness for signal line is not connected	Connect a head harness for signal line
	Power supply cable of a head is disconnected	Connect a power supply cable of a head
	Head harness for signal line is disconnected	Connect a head harness for signal line
	Head has failed	Replace a head
	Sensor S8 or S9 has failed (Head is not regular position)	Replace the sensor board assembly of S8 or S9
	Head block incorrectly position (Cam, joint gear or gear has failed)	Replace the cam, joint gear or gear
	Planetary gears 1, 2 and 3 cannot change correctly	Replace the mechanism assembly
Paper feeding irregular occurs in printing side	Belt incorrectly tension	Readjust the belt tension correctly
	Specified paper does not use	Use the specified paper
	Loss of synchronism in STM (Belt incorrectly tension)	Readjust the belt tension correctly
	Head block is slipped out of the place	Reinstall a head block
	Gear has failed (variety of core etc.)	Replace a gear
Creases occurs in printing side	Head incorrectly position	Readjust a head position correctly
	Specified paper does not use	Use the specified paper
	Loss of synchronism in STM (Belt incorrectly tension)	Readjust the belt tension correctly
	Head block is slipped out of the place	Reinstall a head block
	Static electricity plate is not installed correctly	Reinstall a static electricity plate
	Head block incorrectly position (Cam, joint gear or gear has failed)	Replace the cam, joint gear or gear

Symptom	Cause	Remedy
Color print gap occurs in printing side	Grip roller does not meshing to pinch roller	Replace the mechanism deck
	Back tension spring unsuitability strength	Replace the mechanism deck
	Torque limiter unsuitability strength	Replace the mechanism deck
	Belt incorrectly tension	Readjust the belt tension correctly
	Loss of synchronism in STM (Belt incorrectly tension)	Reinstall a STM assembly
	Head block is slipped out of the place (Defective of compressibility)	Reinstall a head block
	Head block incorrectly position (Cam, joint gear or gear has failed)	Replace the cam, joint gear or gear
Density irregular occurs in printing side	Head has failed	Replace a head
	Head block is slipped out of the place	Reinstall a head block
	Head block incorrectly position (Cam, joint gear or gear has failed)	Replace the cam, joint gear or gear
Thinning print occurs in printing side	Head incorrectly position	Readjust the head position correctly
	Specified paper does not use	Use the specified paper
	Head block is slipped out of the place (Defective of compressibility)	Reinstall a head block
	Head block incorrectly position (Cam, joint gear or gear has failed)	Replace the cam, joint gear or gear
Streak lines occurs in printing side	Head incorrectly position	Replace a head block assembly
	Head block is slipped out of the place	Reinstall a head block
Irregular sound occurs under printing	Ribbon cassette has failed	Replace a ribbon cassette
	Back tension spring unsuitability strength	Replace the mechanism deck
	Torque limiter unsuitability strength	Replace the mechanism deck
	Loss of synchronism in STM (Belt incorrectly tension)	Readjust the belt tension correctly
	Gear is damaged	Replace a gear
Paper jammed	Overlapped paper feed	Remove the overlapped feed paper (Do not use the removed paper) Replace the mechanism deck
	Overlapped paper feed cause of the paper stuck	Remove the overlapped feed paper (Do not use the removed paper) Dispose the reminded paper thoroughly
	Ribbon cassette has failed (Paper caught in the bottom of the cassette)	Replace a ribbon cassette
	Head block is slipped out of the place	Reinstall a head block
	Loss of synchronism in STM (Belt incorrectly tension)	Readjust the belt tension correctly
	STM has failed (No rotating)	Replace a STM assembly
	STM connector is not connected	Connect the connector on a STM assembly
	Harness of the rear side is detached to the paper carrying path	Improve wiring of the harness

Symptom	Cause	Remedy
Does not paper delivery	Planetary gears 1, 2 and 3 cannot change correctly	Replace the mechanism deck
	Ribbon cassette has failed (Paper caught in the bottom of the cassette)	Replace a ribbon cassette
	Head block is slipped out of the place	Reinstall a head block
	Loss of synchronism in STM (Belt incorrectly tension)	Readjust the belt tension correctly
	STM has failed (No rotating)	Replace a STM assembly
	STM connector is not connected	Connect the connector on a STM assembly
	Delivery roller has failed	Replace a delivery roller assembly
	Limit lever is detached from the bearings	Reinstall the bearings of a limit lever
	Gear is damaged	Replace a gear
Too fast timing operates head cleaning	DC fan has failed	Replace a DC fan
	DC fan connector is not connected	Connect a DC fan connector
Indicator does not disappear in spite of no accumulates the delivered paper	Limit lever spring is not hanged	Re-hang a limit lever spring
	Limit lever is detached from the bearings	Reinstall the bearings of a limit lever
	Delivery guide incorrectly position	Reinstall a delivery guide
	S11 sensor has failed	Replace a S11 sensor board assembly

SAFETY CHECK-OUT

After correcting the original service problem, perform the following safety checks before releasing the set to the customer :

Check the metal trim, "metallized" knobs, screws, and all other exposed metal parts for AC leakage. Check leakage as described below.

LEAKAGE TEST

The AC leakage from any exposed metal part to earth ground and from all exposed metal parts to any exposed metal part having a return to chassis, must not exceed 0.5 mA. Leakage current can be measured by any one of three methods.

1. A commercial leakage tester, such as the Simpson 229 or RCA WT-540A. Follow the manufacturers' instructions to use these instruments.
2. A battery-operated AC milliammeter. The Data Precision 245 digital multimeter is suitable for this job.
3. Measuring the voltage drop across a resistor by means of a VOM or battery-operated AC voltmeter. The "limit" indication is 0.5 V, so analog meters must have an accurate low-voltage scale. The Simpson 250 and Sanwa SH-63Trd are examples of a passive VOM that is suitable. (See Fig. A)

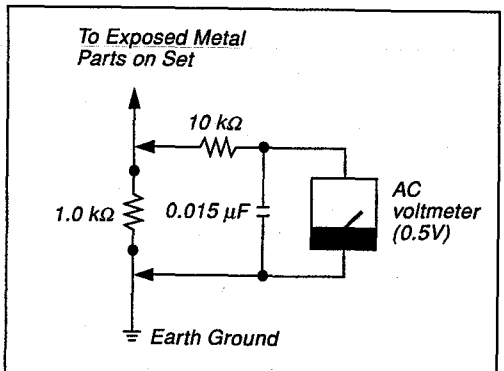


Fig A. Using an AC voltmeter to check AC leakage.